ARICH CABINET, C.CASBON WITH C.CASBON Variety of Inventions : C.CASBON

Unlock'd and open'd, for the Recreation of Ingenious Spirits at their vacant hours.

Being Receipts and Conceits of several Natures, and fit for those who are lovers of Natural and Artificial Conclusions.

AS ALSO

Variety of Recreative Fire-works both for *Land*, *Air*, and *Water*. And Fire-works of Service for Sea and Shore.

Whereunto is added divers Experiments in *Drawing*, *Painting*, *Arithmetick*, *Geometry*, *Astronomy*, and other parts of the Mathematicks.

Likewise Directions for Ringing the most usual Peals, that belong to that Art.

Collected by *J. W.* a lover of Artificial Conclusions.

The Fifth Edition, with many Additions.

LONDON,
Printed for *William Whitwood* at the sign of the Golden Bell in *Duck-Lane* near *Smith-field*.

1670

TO ALL LOVERS of Ingenious and Artificial Conclusions.

COurteous Reader, (you know and I know, that) the wits of this age are acute and various, therefore how to please all mens fancies, is a Task too ponderous for my undertaking. I have unlock'd and open'd to your view a rich Cabinet of varieties; if there be any thing therein contained that may yield you profit, solace of the mind, recreation of the spirits, or content, I shall think my labour well bestowed, and be glad; If it be otherwise, I shall be sorry that I have nothing therein to please your mind, intreating you to shut down the lid again, and then I hope there is no hurt done.

This may be compared to a Garden composed of sundry varieties, wherein you may pick and cull out those Flowers that best please you, and are fittest for your pleasure or profit: For the laborious

Bee gathereth her cordial Honey, and the venomous Spider her corroding poison (many times) from the same Flower. And I know that there are some envious Criticks that will snarle at me for publishing many things contained herein; But I care the less, because I aim at the publick (and not my own private) good; and no man (I think) should be born only to himself, and hide his Talent: And therefore these few Receipts which I have Collected, with divers of mine own (gentle Reader) I dedicate freely to thy use; Knowing that Art imitating Nature, glories alwayes in in the variety of things which she produceth, to satisfie the minds of curious Inquisitours of Natural and Artificial Conclusions. Therefore I doubt not but there are many things contained in this small Volume, that will give satisfaction to the Ingenious for whose sakes I have compiled it: So taking leave, I will ever remain,

An Artists Friend,

JOHN WHITE.

A Table for the ready finding of each ſeveral Receipt in this Book.

How

How

Some few (but Choice) Physical Receipts, &c.

A Table or Heads of the several sorts of Fire-works both for Land and Sea Service, contained in this ensuing Treatise.

Of

The

Necessary directions for Drawing and Painting.

Experiments performed by Legerdemain.

Acon-

Experiments in Arithmetick.

Pleasant Questions in Arithmetick.

Experiments in Geometry.

The

A rich Cabinet with variety of Inventions, C.CASBON

RECEIPT I.

How to make a glorious light with a Candle, like the Sun shine.

THis is a rare Conceit, and fit for those Artists, or others that perform curious and fine works by Candle-light, as Jewellers, Ingravers, or the like, or those which are weak-sighted to read by, never dazeling the eye.

Go to the Glass-house, or Glass-shop, and let them blow you a thin round Globe-glass, bigger than a penny Loof, (the bigger the better) with a short neck like a Bottle, they know how to make them. When you have this Glass, with Glew or Wax binde a piece of Tape or Pack-threed about the neck or top, making a little loop there with to hang by; then fill your Glass with the pureſt Conduit or spring-water you can get (putting some Aqua-vitæ therein to keep it from freezing) stopping it close, to keep the dust out; having thus done, if you will use it at a Table or Bench, knock a Tenter-hook or Naile into the Seeling or Shelf, and with a

Tape or Pack-threed faſten it to the loop, and hang it up; (but a round ſtick were better to hang it on, putting it into a poſt or hole in the wall, that you may let it higher or lower at your pleaſure in turning the ſtick:) then behind your Glaſs ſet a Candle lighted upon the Table, and you ſhall have a glorious light through the Glaſs and water for your purpoſe; behold the figure following.

Some uſe to place a ſheet of oiled paper betwixt them and a candle, and this will cauſe a good light.

RECEIPT II.

How (for a Wager) to cleave a thin Groat, or other piece of Silver in ſunder, like two Groats.

THis to many will ſeem impoſſible, yet may thus be done. Take three ſmall pins, and prick them down upon a board, or table triangular-wiſe, and then take a thin whole Groat, and lay it level on the heads of the three Pins, as you ſee in this ſame Figure; having thus done, take a piece of Brimſtone

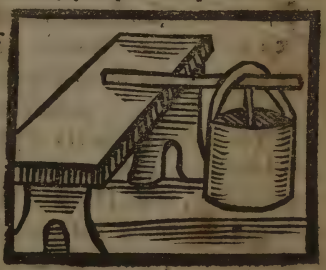
and

and bruiſe or beat it to powder; covering the Groat therewith, all over, in a pretty thickneſſe, and then with a lighted piece of paper, or a candle, ſet the Brimſtone on fire until it be conſumed; when this is done, and the fire out, you ſhall ſee the edges to open a little like a dry Oiſter, then take a Knife and put into it, and it will eaſily cleave in ſunder; having the impreſſion on both ſides very perfect.

RECEIPT III.

To lay one end of a ſtaffe or ſtick upon a ſtoul, or table, and to hang a Pail full of water at the other end, having nothing to hold on the ſtick, nor nothing under the Paile.

TO perform this conceit, doe thus, Lay one end of a Staffe or Stick a pretty way upon a table or Stool (ſo that it roule not off) letting the other end hang over the table likewiſe, (as you may ſee in this Figure here expreſſed) then take a Pail full of water, and hang the payle or handle upon the ſame; but you muſt have another ſhort ſtick that will reach juſt from the inſide of the bottom of the pail,



to the long ſtick on the table, placing the ſhort ſtick juſt under the payle very ſtiffe, and then ſhall the Payle of water hang from the ground upon the long ſtaves end on the table without falling, ſeeming very ſtrange, but this is ſomthing difficult at firſt, till you hit juſt in the center of gravity: yet I have often done it.

RECEIPT IV.

How to make dainty ſport with a Cat.

IF you will have ſome ſport with a Cat, then get a little Bell, ſuch as the tame Hawks have at their legs, and tye the Bell ſomething hard at the end of the Cats tayle and let her go, ſhe feeling of her tayle ſmart, and hearing of the Bell gingle, ſhe will run up and down as if ſhe were mad, flying againſt the walls and windows: then if ſhe can, ſhe will get into ſome hole to hide her ſelf, but when ſhe wags her tayle never ſo little, then out ſhe comes, and is as mad as before, and never will reſt in quiet till it be taken off, or ſhe can get it off her ſelf.

Another.

Some have ſhod a cat round, with putting melted Pitch into four Walnut-ſhels, and placing her feet therein, and ſhe will make pretty ſport.

Another.

I was told of a merry Fellow that came into an Ale-houſe in cold weather, and finding but a reaſonable Fire, ſaid, He would make the Cat piſſe it out, and watching his opportuni y, he getteth his Hoſteſſes Cat, putting her head betwixt his thighs,

and holding her four feet fast in one hand, and with the other hand held up her tayle near the fire, and did pisse such abundance that she quite quenched the same.

RECEIPT V.

How to make very pretty sport with Ducks, or Poultry.

ONe Summers day my self and two or three Friends, walked into the Fields for our recreation, and being dry and hungry, we went to a Victualling-house in a Country Village, where we could get nothing to eat but Bread and cheese, and sitting in an Arbour, the Womans Ducks being near us we flung them our parings of cheese, the Ducks were very greedy of the same, (then quoth one of our Company) I will shew you some sport.

Presently he getteth about a yard of strong threed, and finding a little rag of red cloath, tyeth it to one end of the threed, and at the other end tyeth a piece of Cheese (somewhat lesser then a Bean) with part of the rind on: and throweth it amongst the parings to the Fowle, presently one of them swalloweth it down, now the rest of the threed and the Rag dragged behind her, and she wadling up and down, perceived the red Rag to follow her, of which she was sore afraid, then she did run from place to place, not knownig what to doe, at length she took wing and flew into a Pond of water, and there she quackt, but presently she spy'd the rag to swim after her, then down shedived, then up a-

gain, then down, then up, at length out of the Pond again in her former posture, at which the Woman was amazed, and thought her Duck was bewitched. But at the length the threed was tangled at some bushor other, and so broke, or pulled the Cheese out of her belly, and then she was quiet.

The like sport you may have with other Poultry, by tying a long white Goose-quil, (or a light stick with a rag on the top) upright at her tayle.

RECEIPT VI.

How to have pretty sport at Cock-fighting with a single Cock.

TAke a pretty big Looking-glass, and set it against a wall on the ground in any Room or other place (not full upright,) tying the string of the Glass with a nail to keep it from falling: then put a Cock into the room, and throw some crums near the Glass, and when he seeth his picture therein, you shall have dainty sport with him, for he will fight vehemently with his own shadow, supposing there is another Cock, for as he moves, so doth his shadow, some times with his motion he loseth it, and then he will look behind the Glass for the other Cock, and not finding him, he will clap his wings and crow, as though he had got the victory, but spying it again he wil begin a fresh battle.

If you please, you may hold the Glass in your hand moving it up and down, and he will doe the like.

RE-

RECEIPT VII.

How to know the hour of the day or night at any time, by a Ring and a Glass, being a dainty clock.

TAke a small Threed, and put it through a Gold Ring, or other like Ring, and doubling the Threed, tye a pretty big knot at the end, and cut it off, and let the doubled Threed be seven or eight inches long, then take a Bole-gloss, and set it on a Table, and hold the knot of the thred somthing hard betwixt the ends of your forefinger and your thumb, as you see here in the figure, which will cause the Pulses of your wrist to beat; let the ring hang in the middle of the glass a little within the rim, then the working of your Pulse will make the Ring to move striking upon the sides of the Glass the hour of the day or night, and then the Ring will stand still again.

RECEIPT VIII.

Another excllent Rule, to know the hour of the Day or Night at any time.

IF any two (or more) Parties be in company together, let one of them take ſomething from the ground, (what they pleaſe) and give it to another Party ſtanding by.

Now, if the thing taken up hath grown, and may grow again, as Seeds, Hearbs, or the like, it is then 1. 4. 7. or 10. of the Clock, or very near.

If it did never grow, nor never ſhall, as Stones, Metals, Pot-ſheards, Glaſs or the like, it is then 2. 5. 8. or 11. of the Clock, or very near.

But if it hath grown, and will never grow again, as Sticks, Chips, Shels, or ſuch like, it is then 3. 6. 9. or 12. of the clock, or very near.

But remember this Caution,

That both they that give the judgement, and they that take up the thing, do not know what hour it is before they try the Conceit.

RE-

RECEIPT IX.

How to ſpit three Capons upon one ſpit at once, and to have an equal fire at each of them, yet one ſhall be quite raw, the other be well boyled, and the third thoroughly roaſted.

I Have heard that this Conceit was performed by a Noble-mans Cook upon a Wager, and thus he did it. To tend the firſt Capon he had a Boy that continually baſted and poured cold water on the ſame, and ſo kept it raw.

To the ſecond, he had another like attendant to baſte, and pour continually ſeething and ſcalding water, and that was well boyled.

The third he tended himſelf, baſting it with Butter. and that was thorowly roaſted, and ſo he won the wager.

RECEIPT X.

How to make two Knives (with a ſhort ſtick) to hang upon the brim of a glaſs without falling.

TAke a little ſtick, ſome foure inches long, and make it ſharp at oneend like a Butchers Scuer, and then get two Knives, ſomewhat of an equall poiſe, and prick the points of them towards the bigger end of the ſtick on each ſide ſlope-wiſe, as yo

you may see here in the Figure; then put the small end of the stick upon the rim of a Glass of wine or beer, & you may take up the Glass and drink, and they will not fall off.

RECEIPT XI.

A speedy way how to make a Horse fat, plump, and lusty.

TAke *Cummin-seed*, *Annis-seed*, *Enula-campana*, and *Turmerick*, a penny-worth of each, seeth them well with three heads of Garlick in a Gallon of Ale, then strain it, and press out as much of the substance as you can well wring out and give it your Horse to drink bloud-warm, a full quart at once, then ride him till he be hot, then afterward stable him, curry and litter him well until he be cold, doe this two or three mornings together, and then turn him to grass, & he will thrive wonderfully in a short time: if there were a handfull of *Groundsell* sodden with the afore-said ingredients, it would doe well.

Now if you will not put him to Grass, but keep him in the Stable, give him to eat with his Provender some of the roots of *Enula-campana*, with some *Cummin-seeds* beaten together, or the *Enula-campana* shred

shred small, for fourteen dayes together, this will make a lean Horse to thrive, and grow fat in one moneth more than he would otherwise have done in a quarter of a year.

RECEIPT XII.

How to keep a Horse from tyring by the way, and to make him foam at the Bit.

WHen you are to ride, and fear that your Horse may tire, carry with you (in some lethern Bag) a good quantity of the powder of *Enula campana*, and when others do bait their Horses in their ordinary manner, your Horse being first well walked, rubbed, and littered, then give him a good handfull of your powder, in a quart of strong Ale or Beer, with a horn, tying his head high to the rack, and you need to give him no other provender, (or very little) till night, then let him be well meated, & give him in the morning two pennyworth of bread, and his Ale and powder, but remember to water at night.

RECEIPT XIII.

How one may put his finger, or wash his hands in melted Lead, without danger, or burning.

TAke an ounce of Quick-silver, two ounces of good Bole-armoniack, half an ounce of Camphire, and two ounces of Aqua-vitæ, the

them together, and put them into a brazen Morter, and beat them with a Peſtle: having thus done, annoint your hands all over throughly well with this oyntment, and then you may put your finger into melted Lead, or you may waſh your hands therewith, if one pour the Lead upon them, and it will neither ſcald nor burn you.

RECEIPT XIV.

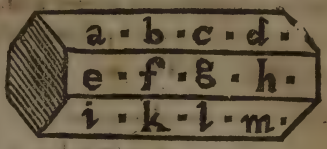
A very pretty and ready way to teach Children or others ſuddenly to learn their A B C *in manner of play.*

CAuſe four pieces of Bone or Wood to be cut into ſix ſquare like Dice, & upon every ſide or ſquare let one of the letters of the Alphabet be ingraven or writ, as, A.B.C.D.E.F. upon one of them, then G H I K L M on the other, and ſo of the reſt in order, as you may ſee here in the Figure.

Now the Child taking delight, and uſing to play with them (amongſt other Children) and being told what Letters are uppermoſt, will ſoon learn their Alphabet, as it were by the way of ſport and paſtime.

Alſo, you may cauſe one piece of bone or wood to be made into ſix long ſquare ſides, about an inch and a half of length, and let each ſide be ingraven, or written with four Letters as a.b.c.d. and ſo of the reſt of the ſides, and let them throw

throw it, and name those Letters which are uppermost; and when they have learned the great Letters, you may write the small Letters on, as it is here on the Figure.



RECEIPT XV.

An excellent way to teach one to read speedily and truly, that before could not distinguish their Syllables.

LEt a Scholar or one that can read well, take any Book of small value, and at every Syllables end underneath or at the top, with a small Pen of Ink, let them make a little speck or mark: but if the speck or mark were made with red Ink it were the better; Or if it be in a Book that you would not deface, then take a small Pin, or Needle, and prick little holes at each Syllable, which will hardly be perceived. This experiment is best to be made with hard words of many Syllables, as in the example following.

Abraham, Achitophel, Bartholomew,

Christopher, Demetrius Anabaptist,

Mathematician, Nebuchadnezar, Quotidian, Patrimony, &c.

These

These to the ingenious will suffice, for I have known those which by no means could be brought to read, yet in a short time by this method they have learned to read perfectly.

RECEIPT XVI.

Of divers rare and dainty conceited motions, performed by the operation of the Magnet, *or* Load-stone.

MAny and wonderful Mathematical conclusions are performed by the *Magnet*, or *Load-stone*, only I will give a touch at some few for recreation.

These stones are to be had at the Iron-mongers, but they ought to be polished and made fit by a cunning Artist. This stone hath his two Poles, one North the other South, answerable to the Poles of the world. For if you take a piece of Wyre of 4 or 5 Inches long, and touch one end thereof with a Load-stone, and then thrust it through a piece of Cork, putting it to swim in a Bason of water, presently you shall see one end of the Wyre will turn full North, and the other full South.

This receipt is profitable for some Travellers, who having a Sewing-needle about them that is touched with this stone, may prick it in some little light piece of wood or Cork, and place it in the water, and it will set out the North and South instead of a Compass.

If for recreation you take two Wyres, & put each Wyre into a Cork, touch one Wyres end with the North end of the stone, and the other Wyres end with

with the South end of the ſtone, and then put them both into a Baſon of water a pretty way aſunder, yet they will begin to move and ſtir, and draw nearer together, and on the ſuddain joyn and meet: Now if upon thoſe Wyres or Corks there were placed little paper Tilters on Horſe-back, they would run their courſe at one another in the water very prettily.

Alſo, if this ſtone or Magnet, be incloſed in a box of Wood, Stone, Silver, or Braſs, yet it will extend its operation and working by many pretty and ingenious practices admirable to behold.

As for Example, if you will make the forms and pourtraitures of divers things in thin Paſt-board, as Horſe-men, Foot-men, Ships, Boats, Beaſts, Birds, Flyes, Wormes, Serpents, or the like, you may cloſely convey into them a ſhort piece of Wyre, and ſet them upon a Board, Trencher, or Paſtboard, and if you will have them move or walk, then hold the Load-ſtone cloſe in your hand, under the Board, and that way which you move your hand underneath, that way the images will move and creep on the top.

Alſo, if you place the Load-ſtone privately to, or near the Seeling, or over a Door, and then hold a piece of Iron near to it (tying a threed to the Iron) that it touch not the ſtone, which will attract it, and then the Iron will ſeem to hang in the Ayre. If you touch an Iron Ring with this ſtone, it will take up a dozen or more rings together, hanging one to the other like a chain. Alſo, if a knives point be touched therewith, it will take up Needles or wyre, and by it you may know the counterfeit, or New-gate halfe-penny, as ſome call them.

Many

Many other rare concluſions may be performed by this ſtone, which I forbear to write of. Fire, Garlick, or Onions, ſpoyleth the vertue of this ſtone; therefore let it not touch or come near them.

RECEIPT XVII.

The making of the Thermometer, or Weather Glaſs, whereby you may certainly fore-tell the alteration and change of the weather, a good many hours before it commeth to paſs.

THis Weather-glaſs is compos'd of a quantity of Water and Air Artifically incloſed therein, the water being ſubject to a continual motion (either up-ward or down-ward) as the weather changeth: The Glaſſes you may have ready made at the Glaſs-ſhops, but be ſure to chuſe the longeſt and ſlendereſt ſhanked Glaſſes, with a ſmall head, for they are beſt. You muſt alſo have another Glaſs for a Ciſtern at the bottome to receive the water, the framing of it is thus.

Make a frame taper-wiſe of ſome fine light Deale or other wood, (only let the bottom board be ſomewhat thick and heavie to make it ſtand the ſteadier,) and let the head or uppermoſt board be leſſer than the bottom, having a hole in the middle to put the glaſs through, as you may ſee in the Figure.

Your

Your Frame ſhould beabout a quarter of an inch longer than the ſhank of the glaſs becauſe the lower end of the ſhank ſhould almoſt reach to the bottom of the ciſtern: Now before you put in your Glaſs, you muſt divide the ſhank into certain degrees, from 1 to 12 or more beginning from the rim of the Ciſtern, upward, placing figures thereon, having thus done, turn the head of your long glaſs downward and with a funnel fill it almoſt full of water, then put the Ciſtern on the bottom board, and holding the frame ſloping put the ſhank of the Glaſs (through the hole at the head) into the Ciſtern, and then ſet it upright. Now you muſt know at what degree to ſet your water, according to the ſeaſon of the year: for if it be in Summer and very hot weather, then to ſet it at one or two deg. is beſt, if the weather be temperate, then three or four, but in cold or froſt ſet it at nine or ten. To this theſe degrees, (if your water be not low enough) you muſt pull up your Glaſs a very little way from the

bottom of the Ciſtern, & very ſuddenly put it down again, if yet it be not at the right degree, pull it up again; and quickly down (as before) till you have your deſire.

But take heed, for if your water be fallen too low in the Ciſterne, then you muſt take them out, and begin your work again. When it is thus done, wax or cement your Glaſs and Ciſtern together, and then you may cover and make a rock about your Ciſtern, with Paſt-boord or the like, glewing or paſting pieces of Mother of Pearle ſhels, Smiths Cinders, pieces of Glaſs, Antimony, or other ſhining things what beſt pleaſeth your fancy; or you may cover it with Moſs, or the like, and it is finiſht.

The quality of the water in this Glaſs is to aſcend by degrees with cold, and to deſcend with heat; for in the Winter the water will be at the top of the Glaſs, and in Summer down to the rock. The water ought to be very clear, and coloured by Art, both for ornament, and the plainer to diſtinguiſh it from the Glaſs: If you will have it green, uſe Verdigreaſe; if yellow, uſe Saffron, or Turmerick, if red, uſe Braſil, or Turnſoile.

The uſe and property of the Glaſs.

By the uncertain motion of the water in this Glaſs it is a certain ſign of fickle and unconſtant weather, but contrarily, the continuance of the water at any one degree is a ſure token that the weather will continue at that ſtay it is then at whether it be fair or foul, froſt or ſnow. But when the water either riſeth or falleth, the weather will then preſenly change: Alſo, the ſudden falling of the water is a ſure token of wet weather.

RE-

RECEIPT XVIII.

A pretty way to catch Kites, Ravens, Crowes, Magpies, or the like, alive.

GOe to the Apothecaries, and bestow two pence in *Nux vomica*, then beat them to powder, or slice it as you do Ginger, this being done, take raw Flesh or Liver, & cut it into little pieces or gobbets, that the Fowl may swallow them whole, then cut holes in the same, & put your powder or slices therein, and then lay these pieces where they haunt, but as soon as they have swallowed down the same, they will flye to the next high Tree they can come at, and this presently makes them so drunk, or sick, that they streight will fall down from the top of the tree to the ground, that you may take them up alive with your hand: But you must be sure to watch them and run presently to the tree, for they will soon recover and flye away.

I believe if it were sodden with other Grain, it would have the like operation with other Fowl.

RECEIPT XIX.

A ready way to catch Pidegons, or other Fowl.

TAke pieces of brown Paper &, roul them round making Coffins of them, such as the Grocers make to put their fruit in; let them not be above a finger long, paste the sides and ends of them with some starch, clip the upper part of them round with a pair of Sheers, then anoint the inside of the uppermost skirts of them round about with Birdlime, or some stuff that will but cling to the Feathers: But

You muſt (a day or two before you uſe it,) lay or ſtrew ſome Peaſe or other Grain to make them haunt the place and they will be the leſs fearful; then if you pleaſe, make a hole in the ground a little way, and put your Coffins upright or ſloping therein a few Peaſon or Corn in them, ſtrewing here and there Peaſon near them, and when ſhe picketh into the coffin ſhe is immediately hooked, and blindfolded, not ſeeing which way to flye, and thus you may take them eaſily.

RECEIPT XX.

A merry Receipt, being a ready and ſure way how to catch a Pick-pocket.

AS I was writing the former Receipt, it put me in mind of a pretty conceit that a Friend once related to me, which was thus: A Gentleman being in a throng in a Fair, had his Purſe pickt out of his pocket, he miſſing it was ſomewhat vext but could not mend it, but ſtudied how (if he could) to be revenged: preſently he buyeth two penny-worth of Fiſh-hooks, and cauſeth a Taylor to ſew them round about toward the upper part of his pockets, with the points of them down-wards, and ſo the next day away he goes to the Fair again amongſt the throng, throwing his Cloak on one ſhoulder, ſeeming careleſs of his pocket, wherein he had ſtore of money: Preſently there was a Diver nibling at the bait, and nimbly had his hand in his pocket: The Gentleman being wary (perceived that the Fiſh had ſwallowed the hook) gives a jerk aſide which cauſed the hooks

to

to catch good hold in his hand, and then he had him sure : Then said the Gentleman, Fellow, what maketh thy hand in my pocket ? O god Sir, (replyed the pick-pocket) pardon me, I cannot pull it out. Come (saith the Gentleman softly to him, because no body should take notice) go along with me: So cheek by joll they walked together, with his hand fast in the pocket (but covered with his Cloak) and to the Tavern lovingly they go together, where the Gentleman told him of the loss he had sustained the day before , and making of him to restore back his money, he cut out his pocket, and let him goe. Surely this Pick-pocket had good store of picking work to get the hooks out of his hands again.

RECEIPT XXI.

How to make Fowls and other small Birds drunk, that you may take them with your hands.

YOu must observe what meat they love or use to eat, as Wheat, Barley, or other Grain, and lay the same to steep in the Lees of Wine, or in *Aquavitæ*, or in the juyce of Hemlock, and strew the same Grain in the places where the Birds do haunt.

Another.

Take Tormentil and boyl it with strong Wine, Wheat, Barley, or other Grain, then strew this in those places where you intend to take them, or where they use to haunt, and the Birds will eat the pieces among the grain, wich will make them so drunk that they cannot flye away.

Another.

Make Paſt with Barley meal, Onion blades, and Henbane ſeeds, and put or throw it where the Birds doe haunt.

Theſe experiments are beſt to be done in Winter in a deep Snow.

RECEIPT XXII.

A dainty way to catch Fiſh in a dark night, with a Candle under Water.

GEt an Urinal, and put pretty ſoft clay therein, and with ſomething that is flat at the end preſse the clay gently to the bottom of the glaſs, ſmoothing it as well as you can, then take a ſtick and ſhape it about the bigneſs of a Candles end, wet the ſtick, and put it into the neck of the glaſs, making a hole in the middle of the clay, as you make clay candle-ſticks; then make a little hoop of a Willow ſtick, and tye pieces of cork in four places of the hoop equally diſtant, and get a thin light round piece of board, and with four little ſticks of an equall length, tye one end of them to the Corks, and the other ends faſten to the board to ſupport it, as you may ſee here in this Figure.

In

In the board you must make a hole in the middle to put the neck of the Glass through, & there tye it and make a loope with a string to the board that you may with a long pole put it into the water: when you will use it, put your Candle into the glass in the clay socket, a little below the brim, that the wind blow not the light out. If you please, you may with Wax or Glew put little pieces of Looking-glasses, or other Glass under the board, on the side next the water, and this light will shine a great compasse in the water, and the Fish will streight resort to the same, where you may very easily take them with a Net.

This might be done with the Glass alone, by tying Corks about the neck of the Glass, to keep the mouth above water.

RECEIPT XXIII.

An excellent Bait to catch Fish with an Angle.

MAke Paste with fine Wheat-Flower, tempered with a little Saffron and Sugar, and bait your hook there-with, and they will bite apace. This is a good bait for Roch, Dace, and such like.

Another.

Take the crum of a new penny White-loaf and an ounce of *Coculus India*, and an ounce of Henbane seed finely powdered, temper the same well with good *Aqua-vitæ* into a Paste, and divide them into small pieces bigger than grains of wheat, and then cast handfulls in at once into the water where is store of Fish, and you shall presently see the operation of the same.

RECEIPT XXIV.

How to make one Watching candle, that it shall out-last three Watching candles.

TAke a Pail, or Bucket, and fill it full of water, and set it in the place where you intend that your light shall stand: then take your Candle and warm it at the lower end, and there stick a brass farthing token, or such like; and when you will light your Candle, put it gently down into the middle of the water, (but be sure that the bottom of the Candle do not touch the bottom of the Pail) and then it will swim upright to the very edge near the light. The reason that the Candle will last so long is caused by the coldness of the water; and this is a safe way that no Rat can run away with the Candle lighted, as I have heard that they have done; by endangering the house with fire.

RE-

RECEIPT XXV.

How to write any name or mark upon a Paper, and then burn it to ashes, yet afterward it may be read plainly.

TAke a new clean Pen that was never written withall, and dip it in your own water as you do in Ink; then strip up your Shirt-sleeve above your wrist and upon your arm write your name, or any name or any mark, and then let it dry on your skin, and nothing will be seen, then put down your sleeve and button your wrist. (Do this privately, and it will cause some to wonder:) then take a piece of white paper, and write your name or the mark thereon, with another Pen of black Ink, (but let it be written as like the other as you can) then take the paper and burn it, and lay the ashes on a Table, and stripping up your sleeve, rub the ashes hard with your finger, where you had written with your water, then blow off the ashes, and the name or mark will plainly be read on your arm in black letters.

RECEIPT XXVI.

How to see plainly any thing in a dark Room, in at a Door or Window, standing a great distance off.

IF there be never so dark a Room, with a Door or Window open, Take a Looking-glass in your hand, and hold it against the Sun, at a great distance from the Door or Window, and moving the Glass up

up and down, till the reflection of the Sun be upon your object, and then you may perfectly behold any thing in the Room, or see to read a Letter.

Some unhappy boys use to dazle peoples eyes with a Glass in this order, as they walk the streets.

RECEIPT XXVII.

How to view the back part of your head by Glasses.

IF you would behold the back part or shadow of your Head (for a wound, or the like) take a Looking-glass, & hold it behind your head, and then take another Looking-glass and hold it before you, and from the Glass behind, you may see your shadow in the Glass before you.

RECEIPT XXVIII.

A pretty trick to tell, or name all spots or court Cards in the Pack, and yet never see them.

YOu must privately drop a drop of water or drink (about the bigness of two-pence) on a table before you where you sit, and let any body shuffle the Pack of Cards, and then taking them into your hand place a candle on the table before you (for this trick is best to be done by candle-light) and holding down your head (as you may see in the Figure) lift the Cards above the brim of your Hat, close to your head, that the light of the Candle may shine on the Cards; then in the drop of water (like a Looking-glass) you shall see every speck of each Card before you draw them, which you may name; or putting your finger upon the

spots, you may say that you feel them out; then lay down your first Card, and name the next, as your first Card was the Deuce of Clubs, the next is the five of Spades, and so of the rest.

RECEIPT XXIX.

How to keep or preserve any Fowle, Venison, or other pieces of Flesh, sound and sweet for three weeks, or a moneth together, although the weather be never so hot.

MAke a strong Brine with Bay Salt and white mingled together, so as the water be over-glutted with Salt, and being scalding hot, parboyl therein the Fowl, or Flesh which you intend to keep for some reasonable time, (that is to say, according to the greatness and greasiness thereof,) then hang it up in a convenient cool place, and it will last a sufficient time, without any bad or over-saltish taste.

This is a good way for Sea-men, and others in hot countries, who are inforced sometimes to victual themselves in such intemperate climates where no flesh

fleſh will laſt ſweet four and twenty hours together, by reaſon that they have no means to make the ſame to take Salt, which without queſtion will enter this way and make penetration very ſpeedily, by reaſon of the hot and fiery ſpirit of Salt thus prepared.

RECEIPT XXX.

How to make a ſpeedy or preſent Drink that Travellers may brew for themſelves, when they cannot reliſh their Beer or Ale at their Innes.

TAke a quart of good water, put therein five or ſix ſpoonfuls of good *Aqua-vitæ*, and an ounce of Sugar, with a branch of Roſemary, brew them a pretty while out of one pot into another, and then is your drink prepared.

RECEIPT XXXI.

How to make on the ſuddain, good drink for Mariners, Souldiers, or for poor people, when Beer is ſcant, and Malt dear.

IN time of extremity, theſe things following will ſerve to ſuffice nature (as hath been often proved;) Puta good quantity of wholſom fair water, a ſmall portion or few drops of the Oyl of Sulphur, incorporating them well together, and it is ready.

Another.

One drop or two of the Oyl of Vitriol added to a good quantity of fair water, and well ſtirred together, it performeth the like.

Some

Some mingle Vinegar with good water, and it ſerveth very well to quench the thirſt.

Others will carry a piece of Allom in their pocket if they are to travel, and know not how to get drink or water, and when they are a dry, they put a piece of that in their mouth, and it will fetch up moiſture which will aſſwage the thirſt.

RECEIPT XXXII.

A profitable way to harden Leather, that it ſhall out-laſt other Leather a long time.

THis is a good and profitable Receipt for many poor labouring men, and is thus performed, Take and lay ſuch Leather as is well tanned to ſoak in water, wherein there hath been ſome ſtore of filings of Iron, a long time, or elſe in the water that hath long lain under a Grinding-ſtone, into which ſuch Iron as hath been from time to time gound away, hath there ſetled.

This is good alſo to harden Leather for the Cawkers or Pumps of Ships, or others, to make them laſt long.

RECEIPT XXXIII.

An excellent Receipt to make a dainty ſtreight Walking ſtaff to have knots where you pleaſe.

GEt a ſtreight piece of wood (of your deſired length) of Holly, Aſh, Service-tree, Walnut-tree or Pear-tree, let it be free from knots, or ſhakes, then plain it into ſix or eight ſides, a good deal bigger than your

your Staff shall be; this being done, get a short Punch of Iron, and let the small end be filed about the bigness that you intend your knobs shall be filed about a bench or table, and where you will make the knobs with a hammer punch holes therein, and so do on every side, then plane it over again till you have made your staff smooth, that there be no dents seen thereon; when you have thus done, put it into some cauldron of boiling water for a good space, and when you take it out again, you shall see that it will be full of knobs, for with the heat of the water it forceth the bruises (which were made with the Punch) to swell out of the wood again.

You may file your Punch like a Star, or other work, and it will shew very pretty; I once saw a Partizan, or Captains Leading-staff, which was done in this manner, and being put into a Dyers Cauldron when he dyed blacks, when it was dryed, and rubbed well with Linseed oil, it shewed like Ebony.

RECEIPT XXXIV.

How to write a Love-letter secretly, or from one Friend to another, that cannot be discovered.

TAke a sheet of white Paper, and double it in the middle, then cut holes through both the half-sheets, let the holes be cut like the panes of Glass-windows, or other forms what you best fancy, and then with a Pin prick two little holes at each end, and cut your Paper in two halfs, give one half to your Friend (to whom you intend to write) the other half keep

keep to your ſelf: Now when you do write, lay your cut paper on a half-ſheet of writing Paper, and ſtick two Pins through the two holes that it ſtir not; then through thoſe holes that you did cut, write your mind to your Friend; when you have done take off your Paper with the holes again, and then write ſome other idle words both before and after your lines, but if they were written to make ſome little ſenſe, it would carry the leſs ſuſpicion; then ſeal it up and ſend it.

When your Friend hath received it he muſt lay his cut paper on the ſame, puting Pins into the pin-holes, and then he can read nothing but your mind which you writ, for all the reſt of the lines are covered, obſerve the Figure, and it is eaſily apprehended.

Where the Letter A is placed, that doth ſignifie the half-ſheet of cut paper with holes; where the Letter B is placed, doth ſignifie the ſubſtance of the Letter which you write, and where the Letter C is, doth ſignifie the Letter filled up with lines to joyn to the other words. Now when your Friend writes to you, he muſt do the like.

Another.

Write a Letter (what you pleaſe) on one ſide of Paper with common Ink, then turn your paper, and write on the other ſide with milk, (that which you would have ſecret) and let it dry; (but this muſt be written with a clean pen:) Now when you would read it, hold that ſide which is written with Ink to the fire, and the milky Letters will then ſhow blewiſh on the other ſide, which may be perfectly diſcerned.

RECEIPT XXXV.

How to know when the Moon is juſt at the full, by a Glaſs of water.

TAke an ordinary Drinking-glaſs, and fil it full of water up to the very brim, ſo that it doth not run over, let this be done a little before that the Moon be at full, and then at the very inſtant that the Moon is at the full, the water will preſently boyl over.

RECEIPT XXXVI.

How to know the Moons age at her Increaſe.

IHave been told, that a thin piece of Cypreſs, ſuch as they had wont to make Hat-bands of, if you hold it before your eyes in an evening at the increaſe of the Moon, you ſhall know how many dayes old ſhe is, As when ſhe is one day old, you ſhall ſee but one Moon, at two dayes old two Moons, at three dayes old three Moons; but afterward you ſhall ſee but one again.

RE-

RECEIPT XXXVII.

Another, shewing how to know both the Increase and Decrease of the Moon.

THe Moon giveth such vertue to a stone which is found in *Arabia*, called *Selenite*, of which *Pliny* and others do write, that within the body of the stone the Moon shewe th her self, and increaseth and decreaseth according to the course of the Heaven.

Another.

Our common House-cats also have this property by the predomination that the Moon hath over them, that their Eye-brows do increase, or decrease each day according to the course of the Moon, and her aspects; which thing is daily seen to him that pleaseth to note the experience thereof.

RECEIPT XXXVIII.

A dainty way how to fetch Oyl, or Grease, out of Books, Writings, Papers, or Garments.

GO to the Apothecaries or Grocers, and buy a penniworth or two of the Oyl of Turpentine, and put a drop or two upon the place which is Oyly or Greasie, rubbing it on, and then you shall see how it will drink up the Oyl or Grease, and be presently dry and fair; for this Oyl of Turpentine is a great dryer, and is good to put amongst Oyl colours, to make them dry speedily.

RECEIPT XXXIX.

How to refresh and scoure old pictures that are wrought in Oyle, making them to look almost as fresh as if they were new done.

TAke the Picture out of the frame, then wipe, or brush off the dust very clean, and then lay it level upon a board, or table, pouring good sharp Vinegar all over the same, and therelet it lye and soke for three or four hours; if the Vinegar be dryed up, then pour on more, continually keeping it wet: then beat a piece of dry brick very fine to powder, (and see there be no lumps or stones therein, for they will raze and scratch the Picture) and then put the powder into a course linnen rag, and tye it, and then dip it well in a Porrenger of Vinegar, and with your rag and powder, rub and scour your Picture all over very hard, and then with fair water, or a wet clout, wash the filth away: But if you see any spots or filth remain, then scour it again and wash it; then dry it very well with a cloth, and when you have dryed it, put it again into the frame, and set it in the Sun for a day or two, (for the Sun refresheth the Colours very much) and then rub it hard with a dry woollen cloath till you make it shine, and then hang it up. This will cause it to look almost as fresh as when it was new.

Some use to wash them in Sope and then Size or Varnish them over, but I [illegible] with the Oyle of Vitriol [illegible]

RECEIPT XL.

How to keep Sword-blades, Halberts, Pistols, Knives, Edge-tools, or other things free from rusting for seven years, or more, in a dry house.

TAke Fish Glew, or Ising glass, and cut it in pieces, then with a Hammer beat or bruise it upon an Anvile, or stone, and then put it into a little skillet, or such like, with water, and let it dissolve over a gentle Fire, still stirring it as you do your common Glew; then when it is well boyled take it off, and with a Pensil, or small hair-brush, lay the same, while it is hot, all over your Sword-blade as thin as may be, and then lay it to dry, and it is done. This thin coat keepeth the moystness of the Aire from the Mettle, that it cannot rust; but when you are to wear it or use it, take a blunt knife, and you may easily scale off the thin substance, and then it will be as bright as any silver.

I verily believe, that our common Glew will doe the like, keeping of it in a dry room.

RECEIPT XLI.

An excellent Cement for broken Glasses, China-dishes, or Cups, and such like.

TAke one part of Virgin-wax, and two parts of the tears, or clear drops of Mastick, melt them together and, Cement therewith. But the better is, if you

beat the whiteſt Fiſh-glew or Iſing-glaſs with a hammer till it begin to be clear, and then cut the ſame into very ſmall and ſhort pieces, and diſſolve and melt the ſame over a gentle Fire with Aqua-vitæ; then let one that ſtandeth by, hold both the pieces that are to be cemented over a chafing-diſh of coals till they be warm, and during their heat, lay on the diſſolved Glew with a fine Penſil, then bind the Glaſs with Wyre or Pack thread, to keep it ſteady, and ſo let it remain till it be cold and dry.

Another.

Take a little quantity of unſlaked Lime, wheat-flower, and the White of an Egge, and incorporate them together. Maſtick, Aqua-vitæ, and white lead is good; ſo is Iſing-glaſs, being diſſolved and melted with Rheniſh-wine.

RECEIPT XLII.

How to grave Armes, Poſies, or other devices upon Eggs, which may be ſerved at a table.

MElt Suet pretty warm, and dip in your Eggs in this manner, hold the Egg between your thumb and your fore-finger, and quickly dip one half therein, and hold it in your hand till it be cold, and then dip in the other end that it be thinly covered all over, then take a little Bodkin or Needle, and grave in the Suet what Letters or Words you pleaſe, then lay the egge thus ingraven in good wine-vinegar, or other vinegar

in

n ſome ſtone Pot or Veſſel for the ſpace of ſix or eight hours more, or leſs, according to the ſtrength or ſharpneſs of the ſame, then take out the Eggs, and in hot water diſſolve the Suet from the Shells, then lay the Egge to cool, and the work will appear to be graven in the ſhell of Ruſſet colour. And if the Egge lye long enough in the Vinegar after it is ſo graven, the Letters or Works will appear upon the Egge it ſelf being boyled, and ſo you may ſerve them up at the Table. And if you care not to loſe the meat, you may pick out the ſame, when the ſhell is through graven, and you ſhall have a ſtrange piece of work performed on the ſame.

RECEIPT XLIII.

How to make wax either red or green.

TAke to one pound of Wax in Summer, three ounces of the cleareſt Turpentine; but if you make it in Winter, take four ounces of Turpentine, melt theſe together over a ſoft fire, ſtirring them with a ſtick, and when they are well melted together take it off and let it cool a little, and then mix with the ſame the red root of *Anchuſa*, or Vermilion ground an ounce; and an ounce of ſweet Oyl; ſtir theſe well together again over the fire, then take it off to cool, and pour it into cold water, and then upon a wet board, and your hands wet, you may roul it into what form you pleaſe. Inſtead of Vermillion, you may take three times as much Red-lead, but that is not ſo good.

If you will make Green wax, instead of Vermillion take the like quantity of Verdigrease.

RECEIPT XLIV.

A pretty way how to cast off Flowers in wax, of divers colours.

CAuse a Stick to be turned round at one end, (somewhat Taperwise) like the fashion of a Poking stick, lesser, or bigger, (according to the bigness of the Flower you intend to cast) and at the smaller end thereof, with your knife, cut tents or nicks in the same, long-wise as you see here in the Figure: The letter A.

signifieth the Stick, the letter B. signifieth the Flower: Then take a little panikin, and in the same melt your Wax with a gentle fire, and when it is melted take it off, and then take your Stick (having a Porrenger of fair water by you) & dip the end into the water, and then shake off the water, or suck it off, and then dip the stick into the Wax, and suddainly pull it out again, dipping it into the water again to cool it and then you may take off your flower and

lay

lay it by: and in this sort you may make as many as you please: for yellow Flowers, melt yellow Wax; for Red, red wax; for white, white wax; for green, green wax. Now for stalks for your Flowers you may stick in a small wyre, or a Bent of a raison-frail, or the like. You may have the coloured wax ready made at any of the Wax-chandlers.

RECEIPT XLV.

How to make a Bunch of Grapes with Green Wax, that will seem to be natural.

YOu must get a little stick turned round at the end, about the bigness of an Arrow; and then have your vessel of green wax melted, (as was shewn in the former Receipt,) dipping your stick in the same about the third part of an inch deep, and it will be almost in the fashion of an Acorn cup, make a good many of them. Then take an Egge, and make a little hole in the bigger end of the shell, less than a penny, and get out the yolk thereof and dry the shell; then with a piece of your green wax hold it to the fire, rub or daub the shell therewith thinly all over, then hold the shell in your left hand, and with your other hand take up first one cup, holding the same a little near a candle to warm, and quickly stick it on your egge, and so do with all the rest of the cups, till you have filled it all over; they must be set something close together. Now when you have

thus done, take a little ſtick, about the bigneſs of the tag of a point, and tye a pack-thread in the middle thereof, and then put the ſtick into the hole of the ſhell, and ſo hang it up: You may cut leaves like Vine leaves in green paper; and faſten them to the ſtring or ſtalk above the bunch: I have made ſome womens teeth to water at this conceit, they ſeem ſo natural to the eye; and theſe Grapes will laſt all the year.

RECEIPT XLVI.

How to grave and in-lay Colours into Gold, Silver, Iron or Copper, to ſhew like Ammel.

Firſt, cover your Mettal with a cruſt of warm Wax, and when it is cold, with a fine ſharp bodkin draw, or cut out the ſhape or proportion of what you pleaſe, either Letters, Flowers, Borders, or Scutchions, of a reaſonable largeneſs; then pour upon the ſame empty places (which you have ingraven upon the wax) ſome few drops of ſtrong water or *Aqua-fortis*, and let them lye a while, and when you find them deep enough graven, mingle Orpiment and Maſtick melted together for a yellow colour, and Vermilion and Maſtick for red, and Bice and Maſtick for a blew, and Ceruſe for white, and Ivory burnt for a black. Now when your Maſtick hath been melted with any of the foreſaid colours, let it cool, and beat the ſame into powder, and lay the ſame powder within the graving, and after

lay

lay the mettle upon a small Char-coal fire till the Mastick be melted, and it will remain fast and firm therein a long time.

RECEIPT XLVII.

How to In-lay Boxes, Cabinets, or other things with hard Wax.

WIth a Pen draw upon your Box any thing what best pleaseth your fancy, as Birds, Beasts, Flies, Flowers, Fruits, Leaves, Trayls, Anticks, Letters, &c. Then take a little knife ground sharp at the point, and cut or grave out the work pretty deep which you have drawn with your Pen upon the wood; when you have so done, lay upon the same some red or green hard wax, and with a hot Iron melt and rub hard the wax all over into the crevices, or works which you have cut out, and so let it cool: then take a knife and scrape away the wax to the board, and then you shall have your work which you drew to be inlaid very perfectly in the colour of your wax, as though it were drawn with a Pen, and will never wash nor wear off, when you have scrap't it clean, hold it a little to the fire, and it will fetch a gloss on the wax, and make it to shew the pleasanter.

RE-

RECEIPT XLVIII.

How to harden the white of Eggs into an Artificial Gum fit for many uses.

SEparate the Whites of Eggs clean from the yolks, and beat the Whites very well into a clear oyl, or water, and when it is settled, skim off the froath; then put the same into Bladders, and hang them in a chimney-corner, where fire is usually kept, to dry, and in a few dayes the same will become as hard as Gum Arabick : in hot weather you may hang your Bladders in the Sun to dry : This Gum may be used instead of other Gums, and with it you may varnish Prints, or other things that are washed in colours.

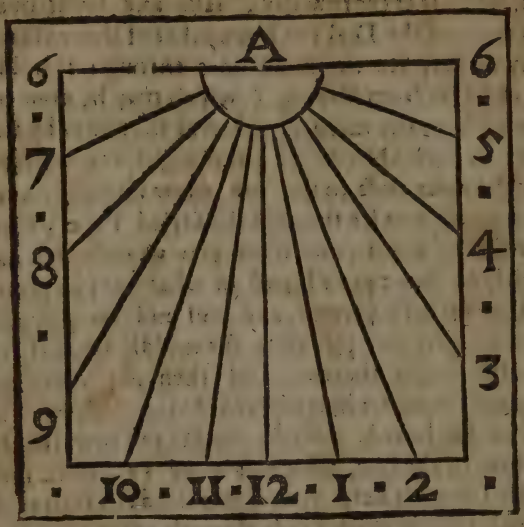
RECEIPT XLIX.

How to make a true South Sun-dial, to be placed upright against a Wall or on a Pole.

I Intend not to speak of the multiplicity of Geometrical and Artificial sorts, and making of Sun-dials, (of which many ingenious Artists have copiously written) but a Mechanick way of two sorts, for the benefit of some who would be glad to know how the hours of the day pass away.

Take a piece of good writing Paper, and rub it over with Linseed-oyl, and hang it to dry in the Sun,

Sun, when it is thorow dry, take and lay it over this print of the Dial (or some other of this nature) that you may see the hour lines through it, holding of it safe from stirring, (which may be done by pinning it to the margent,) then at the center by the letter A. stick a Needle or pin upright, and laying a straight ruler close to the pin draw all those hour-lines which you see through the Oyled Paper; then take off the paper, and when you would mark out a Dial, do thus: get a board of what size you please that is smooth plained, and will not warp, drawing a streight line just dow the middle thereof, and lay this paper thereon, and then put your pin through the center hole toward the top of the streight line on the board, and put another pin towards the bottom of the line, which is your 12 a clock line, (these two pins keep your paper steady,) then with a small bodkin prick a hole through every hour-line of your paper into the board, and then take it off; then stick in your pin into the center hole of the board again, and laying the ruler close to the pin, and close to each hole in the board, mark and draw your hour-lines; (and note that you may extend these hour-lines to what length you please, according to the bigness of the board;) and then figure it as you see in this example following.



Now for the Cock or ſtile of your Diall, it muſt be ſet in the 1 2 hour line, and muſt be juſt equal in height from the board, as the triangular Figure marked with B. ſheweth; the line with pricks is but to direct you which ſide muſt be next to the board: The *S*tile may be made of a thin Iron plate, and cemented in, or of a ſtiffe wire; the upper end of which muſt be put juſt to the center by A. equal to the 6 hour line: when this is done, you muſt get ſome Painter to paint it in Oyl-colours, and ſo ſet it up.

RE-

RECEIPT L.

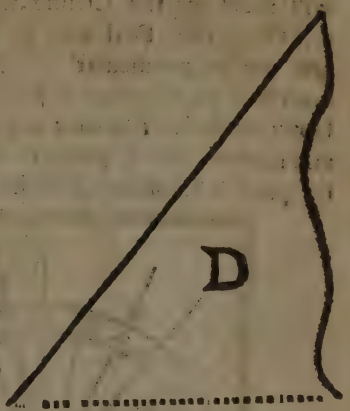
How to make a Horizontal or Flat Dial, to ſtand upon a Poſt, or other place.

THis Diall may be made into ſundry forms, either four-ſquare, ſix, or eight ſquare, or round as you pleaſe, and it is to be placed on the head of a Poſt either in Garden, Yard, or at the out-ſide of a Glaſs-window where the Sun cometh: behold the form.

You

You must note, that the hour-lines of this Dial do vary from the former, and so doth the Stile in height: But you must work with this as in the other with your oyled paper, to draw the hour-lines, and to make a line just in the middle for your 12 a clock line. The center of this Diall is hard by the letter C. and must be more near the middle than the other, because it containeth more hours thereon, for the other will serve but from 6 to 6, but this from 4 to 8. You may make this Dial in Stone, Wood or Mettal, and remember to make the height of this Stile or Cock according to this triangle marked with the letter D. for it must be higher, as you may perceive by this

this Figure. You may make Cement for to faſten the ſtile, with Rozen, powder of brick and ſome chalk, mingled together, and with a hot Iron melt it into the creviſe.



Note, That theſe Dials will not ſerve in any part of England, *but within* 10 *or* 20 *miles of* London.

RECEIPT LI.

A pretty way to make a Sun-Dial on the Cieling of a room, or chamber, whereby you may know the time of the day, as you lye in bed.

IF you have any window South-Eaſt, or South, which is beſt, and that is for your turn, in the lower poſt or frame of the in-ſide of your window, about the middle, faſten with wax a little round piece of Looking-glaſs, or other glaſs, about the bigneſs of a two-pence, (you may cut it round with an old pair of *Scizzers*;) but if you place it higher in your window on a ledge, it will be the better, (as you may ſee here in the Figure,) ſetting it level with the Horizon; and the reflection of the Sun in the Glaſs will

will ſhew on the Cieling the hour of the day, the center of the Dial will be without the window and not perpendicular to the Glaſs. This Diall muſt have no Stile, and it muſt be made like the laſt Horizontal Dial: You may draw the circle, hour-lines, and figures with a penſil or coal, the black ſpot is the piece of Looking-glaſs, the Diall is the cieling.

RECEIPT LII.

How to make a Candle-Dial, whereby you may know the hours of the night.

ONe Winters evening ſitting by the fire, me thought there might be ſome device for a Candle-Dial; At length it came into my head, I made a little

little four ſquare frame of wood, of a piece of a thin Trencher, making the in-ſide thereof fit for the bottom of a Candle-ſtick to ſtand in, which I did ordinarily uſe, on two ſides of the ſquare I faſtened a little piece of Wyre, not a quarter of an inch long, and juſt where the Candle-ſtick ſhould ſtand, on a Table or Board, I made two little holes with a Bodkin for the ends of the two Wyres to go into, and then I ſet down my Candle and Candle-ſtick into the ſquare: Having thus done, I made another long Frame like the frame of a Picture, and paſted half a ſheet of white paper therein upon a thin board, and ſo hang'd it up againſt the wall; Then in the Cieling I faſten'd a ſmall Pulley and, on that Pulley I had two little plummets of lead one broader at the bottom than the other, & ty'd them to a piece of Packthread at each end, and ſo hung them in a Pulley, (as you may better apprehend by the figure, the broadeſt Plummet I pulled down till it gave a ſhadow on the lower end of the paper in

the frame on the wall, (which is now the 1 and 7 a clock line) and where the broad bottom caſt a ſhadow I made a ſpeck with my pen, and then turned an hour-glaſs, and when that was run out, I made another ſpeck, which is the 2 and 8 line, and ſo of the reſt: by theſe diviſions, you may with a pair of compaſſes divide the reſt of the hour line upwards, you muſt pull down the broad Plummet and ſet it at any time to what hour you pleaſe, as by this, it ſhews that it is half an hour paſt 4 or 10 of the clock. You muſt remember to have your candles always of one ſize or weight, as of the eights, or twelves in the pound, or ſuch as you uſually burn. You may take away your Candle and candle-ſtick out of the ſquare frame if you have occaſion, and then ſet it down in its place again, which keeps all right. I have placed the Figures at each end of the hour-lines, as from 1 to 7 on the firſt ſide, and then from 7 to 12 on the other ſide. Note when it is juſt 7 on the firſt ſide, then pull down the Plummet to 7 on the other ſide, which I hold to be the beſt way.

RECEIPT LIII.

How to keep Cherries, Pears, Nuts, or other Fruit a year as freſh as they came from the Tree.

WHen they are pretty ripe, cut off the ſtalks, and put them into an earthen pot well leaded, and then cover them well with Honey, then ſtop the pot

pot with Pitch, or Wax, that no ayre may enter in, and then put the pot in some Sellar, or cool place, burying it well in Sand; and so let it remain till you use it.

RECEIPT LIV.

How to make Grapes, and other Fruit to have no stone or kernels.

IT is said, that if you do plant or set the smaller end of the twig of a vine some-what deep into the earth (which will take root) that those Grapes that will grow thereon shall have no stones: the like effect have Peaches, Apricocks, Damsons, and other Stone-fruits, if the small end of the cyons be grafted into the stocks. Also if you bend down both the ends of an apple or pear-tree cyon, and graft them on both sides of the stock; and the next year when they have grown cut the cyon in the middle, one shall bear fruit with kernels, one the other none.

RECEIPT LV.

How to make yellow Roses grow, and to make Trees and other things grow green all the year.

I Have been informed, that if you graft a white Rose upon a Broom-stalk, or on a Furzon bush, that the same will bear yellow Roses, but they will have no sweet scent.

Also, if you will graft a Rose, or other thing upon a Holly-stock, the leaves of the same will grow green all the year.

RECEIPT LVI.

How to make Apples, Pears, and other Fruit of several colours, and to give them a dainty tast of Spices.

IF you will give a pleasant colour to your Fruit, do thus; For a red, boyl Brasil, Turn-soyl or Sinders, and for a yellow, use Saffron, or Turmerick. Now to give them a dainty taste and smell, you must beat Cloves, Mace, Cinamon, and Nutmegs, to powder, and mixe them with the water of your colours with some honey; then with an auger bore a hole in the biggest part of the tree, unto the middle, something sloping down-wards, and then pour your water and spices into the hole, then with a pin made of the same Wood, or tree, beat it hard into the hole, and saw off the end, and wax it about: This must be done in Winter before the Spring, because when the sap riseth, the colour, scent, and taste also ascendeth with the same.

RECEIPT LVII.

How to know precisely on the Cieling of a Chamber, which way the wind blowes at all times.

THis conceit did I see in King *James* his Bed-chamber at White-hall, the Chamber was an upper room, having a Vane, or Weather-cock of Iron

Iron placed about the top, or tyles of the houſe, which had a long ſtem of Iron, which did reach from thence through the Cieling of the Chamber, upon which Cieling was pointed a Marriners compaſs, with the two and thirty winds thereon, now the lower end of the ſtem of the Vane came through the center of the compaſs, unto which was faſtned an index or needle (like to thoſe in an ordinary Dial) which doth preſently ſhew how the various wind doth ſhift from place to place, which you may continually know preciſely, both night and day.

RECEIPT LVIII.

How to keep drink quick and freſh, that beginneth to be ſowre and dead.

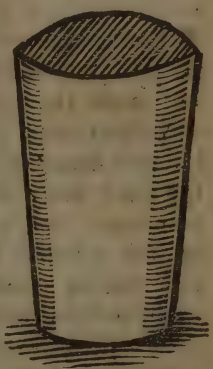
IT is good to put a handful or two of ground malt into your veſſel, (if it begin to fail) and ſtir the Drink and the malt well together, and this will make it to work a-freſh, and become good again, likewiſe if you add new ſtrong drink to the old, the dead drink is forced for to work again to a new head. Some do bury their veſſel of drink in the ground for four and twenty hours, and thereby recover it. Others do throw into the veſſel a handful of Salt. It is alſo good to tilt your veſſel before your drink be half out, and then it will draw freſh to the latter end. But the beſt way is to put a handful or more, of Oat-meal into your veſſel, when it is firſt laid into the Seller, or

Buttery, whereby it will alwayes carry a quick and lively taſte.

RECEIPT LIX.

An excellent way for baking of Bread that it ſhall not be hard cruſted, nor yield ſo many crums.

GO to the Plate-worker, (ſuch as maketh ordinary Dripping-pans) and cauſe him to make a pot, or Pots of his Latten-plate, which may contain half a peck, or greater, or leſs, as you pleaſe, according as you mean the bigneſs of your Loaf ſhall be; let this pot be made with a bottom at the lower end, and open at the top, almoſt like a beaker, as you may ſee here by this Figure,



and when it is done, take a little Butter, and annoint the in-ſide of the pot there-with, and when your Dow is moulded put it into the ſame, (not full to the top) and thruſt it down hard to the bottom, and then ſet it into an oven amongſt other bread, with the leſſer end down-ward; and when it is baked it will eaſily come out: this Loaf will have no hard cruſt, nor crum as other Loaves doe, and will ſhew ſmooth, ſtanding like a Sugar-loaf upon the Table, and in a little compaſs.

RE-

RECEIPT LX.

A dainty, ſtrong, and gliſtering Mortar, or Plaſtering for Cielings, or for Walls.

IT is ſaid that in *Italy* they much uſe this Conceit for Plaiſtering of their Cielings, Floors, or Walls, which is by mixing and well tempering together Oxen and Cowes bloud with fine Loam or Clay, and it will be a very ſtrong and binding ſubſtance, and being well ſmoothed it will gliſter, and become very hard.

Some few (but choice) Physical Receipts, *&c.*

RECEIPT LXI.

Of the great vertues of Crocus Martis, *fit to be used at this time for the Bloody-flux, which so much now reigneth in the Army.*

THis *Crocus Martis* is a powder which you may have at the Apothecaries, this amongst all other Medicines in the world, is the most excellent that can be found against the Bloody-flux, giving it in this order. Take one ounce of conserve of Roses, and one scruple of *Crocus Martis*, and mixe them together, then let the Patient eat it in the morning, and fast thereon two hours, and this (by the Grace of God,) will help him, although he had it never so long, or never so sore. It is also given above all other medicines, in the latter end of a Dropsie; and also against the Flux of Menstrues, and against bleeding at the Nose, and all other Fluxes whatsoever; it helpeth those that spit blood, it is excellent to stop the Flux in wounds, and to heal them and dry them, if ye strew the powder thereon.

RE-

RECEIPT LXII.

Of the rare vertue and operation of the Quinteſſence of Honey, for many diſeaſes, with the Oyl of Wax.

YOu muſt underſtand, that Honey is rather a liquour Divine, than Humane, becauſe it falleth from Heaven, upon Hearbs and Flowers, and is ſuch a ſweet thing, that the like cannot be found upon the earth; this Quinteſſence is of ſuch vertue, that if any be almoſt dead, and drink 2 or 3 Drams thereof, he will preſently recover. If you waſh any wound therewith, or other ſore, it will quickly heal. It is excellent againſt the Cough, Catarrhe, or pain of the Milt and many other Diſeaſes, it helpeth the Fallingſickneſs, the Palſie, and preſerveth the body from putrefaction.

The Oyl of Wax worketh in wounds moſt miraculouſly, healing them, be the ſame never ſo big and wide, (being before wide ſtitched up,) in the ſpace of eleven or twelve days: but ſmaller wounds in three or four days, by anoynting the ſame therewith, and laying a cloath thereon wet in the ſame. Moreover, for inward Diſeaſes it is excellent; It prvoketh Urine which is ſtopped, it helpeth ſtitches, and pain in the loyns, if you drink one dram thereof in white Wine, it helpeth the cold Gout, or Sciatica, and all other griefs coming of cold.

RE-

RECEIPT LXIII.

Of the manifold operations of the Oyle of Cinamon.

THis Oyle is of a miraculous nature, for it pierceth through the flesh and bones, being very hot and dry, and is good against all cold and moist diseases, being comfortable for the head and heart, working the same operation on a dying man as the former. To be short, this Oyle is of such operation and vertue that if a man drink never so little, he shall feel it work to his fingers and toes ends, therefore it pierceth through the whole body, helping all Diseases that come of cold and flegmatick humours, it availeth much with Women in travell, it driveth away the Measels and spots, if the face and hands be anoynted there-with it warmeth the breast, and helps the cold Cough, it consumes all cold Fluxes that proceed from brain and head, and causeth quiet sleep. In brief, this Oyl may be used instead of the natural Balm for many diseases.

RECEIPT LXIV.

How to Distill, and make Oyl of Rosemary Flowers, with its vertue.

TAke Rosemary flowers and stamp them, then put them into a glass with strong wine, and stop it close, setting it in the Sun for five or six dayes, and

and then distill it with a soft fire, and you shall have both water and oyl, which you must separate, keeping the Oyl close in the Glass, whose vertues are these.

It helpeth against all pains in the Head, although they have continued seven years, it comforteth the memory, and also preserveth the eyes, if you drink now and then a drop or two, and put another into the eyes, it helpeth those that are deaf, if it be put into the ears, and also drunk with good wine, it openeth all stoppings of the Liver and Milt, and helpeth against the Dropsie, and yellow Jaundise, it breaketh wind, easeth Cholick, and rising of the Mother. It is also excellent against the Pestilence, or those which have drunk poyson, if they drink of this Oyl, and lay them down to sweat: It comforteth the heart, and cleanseth the blood, and maketh a man merry, and causeth a good colour: It helpeth those that have Canker and Fistula, and such like. And to be brief, it helpeth all the diseases of the body that come of cold and moist humours, although they were never so evil.

RECEIPT LXV.

How to help Deafness, and to expell wind from the Head.

TAke five or six drops, or more, of the Spirit of Wine, or good Aqua-vitæ, in a spoon, and holding down your head on one side, let one pour the

the ſame into your ear, let it continue there about the ſpace of half a quarter of an hour, ſtill holding your head aſide that it run not out, and then you ſhall hear a moſt terrible noiſe and rumbling in your head, which is the wind, then turn your head aſide, and the water will run all out again very hot. Now when you have done thus much on one ſide, you may do as much on the other, but be ſure to keep your head warm after you have done. This I have often proved, and found eaſe thereby.

RECEIPT LXVI.

How to give eaſe, and help the raging pain of the teeth without drawing.

THis is alſo performed with the ſpirit of Wine, or good Aqua-vitæ (as you have read in the former Receipt) by pouring it into the ears, eſpecially on that ſide where your pain lieth: but after that you have let the water run forth of your ears, then with more of the ſame water (againſt the fire) you muſt rub and chaſe your cheeks, and under your jaws, and behind your ears, ſtroaking of them upwards with your hands toward the neck, to drive back the humours: for it is nothing elſe but a cold rheum that diſtilleth from the head into the gums which cauſeth the pain: therefore be ſure to keep the head very warm when you have done.

I have

I have been certified (but how true it is I know not) that three teeth taken out of a dead mans skull, and sowed in a clout, or piece of leather, and worn about them, which were much subject to the Tooth-ach, gave them present ease, and they never were troubled with the same so long as they had those about them.

RECEIPT LXVII.

A dainty Receipt for curious Artists, or others, to strengthen and comfort the eyes.

THis Receipt I had of a curious Ingraver, and my Friend, who every morning before he went to work, in the corner of his Hand-kercheif, (or a clean linnen rag) did put a few drops of Aqua-vitæ, and with the same did wipe the corners of his eyes, eye-browes, and temples, which did keep back the Rheum, and greatly did strengthen and comfort the eyes; of which I have often made triall, and found much comfort.

RECEIPT LXVIII.

Of Fractures, which are bones broken, and also of Dislocations, or joynts displaced, with their cure.

MAny times it happeneth that Leggs, Arms, and Fingers are broken, or out of joynt, and the Parties so hurt are void of help, by reason they have no Chirurgeon near them, therefore for the relief of such

ſuch perſons, I have here ſet down ſome directions, by which they may be eaſed of their pain: But I would not wiſh them to truſt to too much of their own skill, if they have any expert Chirurgeon near hand to do it.

If a Legge, or an Arm be broken, then have a care to place the member in the ſame manner as it was before, which you ſhall do in this manner.

Take a towel, and make it faſt above the place where it is broken, and then take another towel, and faſten it underneath the place where it is broken, then cauſe two men to pull thoſe two towels, that they may thereby extend, or ſtretch out the member and when the member is ſtretched forth at length place the broken bones as they were at the firſt, and ſo by little and little let them ſlack their pulling: then have a cloath ready ſo bigg that it may compaſs the whole member, wet this cloath in white of Eggs, and Oyl of Roſes mingled together, and lay it on the grieved part, then roul it about with a linnen Rouler of four fingers broad, and two yards long, wet the rouler in water, and vinegar mingled together.

Firſt, roul it about the fracture three or four times, then down-ward, and then upward, and ſo faſten it, then roul it with another rouler in the ſame manner, on theſe place thin ſplints of light wood armed well with tow, one fingers breadth from each other, and binde them on with tape, then place the member on ſome ſoft Pillow for twenty dayes: but if a painfull itch do ariſe, open and foment the place with warm water, and then anoynt it with *Unguentum Album*, and roul it up again.

If

If that a finger be broken, roul it with a convenient rouler, and splint it and use the means aforesaid.

RECEIPT LXIX.

A precious Salve for all those that have had any member out of joynt, called Jeremy of Brunswicks Salve.

THis famous Chirurgeon, with this Salve, hath healed those that had formerly their members out of joynt, or those that had been wounded and could not stir or bow the member where they had the hurt; for by this Salve did he bring many stiffe and crooked joynts again to their former strength, to the great admiration of all men, both Chirurgeons and others.

How to make the Salve.

Take two ounces of old Hogs-grease, and of Ducks-grease, and Goose-greas, Hens or Capons-grease, of each two ounces: Linseed-meal, Fenugreek-meal, of each two ounces, Oyl-olive eight ounces; Opopanax, Mastick, and Frankincense, of each an ounce: dissolve the Gums in white wine (that are to be dissolved) and powder the other, mingle them all together, and adde wax and turpentine to them, then boyl them all together with good stirring.

RE-

RECEIPT LXX.

How to order and dreſs a Wound, when it is firſt hurt, with the remedy.

FIrſt, remove all ſuch things as are in the wound, as clotted blood, wood, iron, or the like, then dry the blood with a cloath or ſpunge, and waſh it with cold white wine, and apply ſome unguents or Balmes to the ſame, and on that a plaiſter fit for a wound, then roll it gently, and in a good form, for that helpeth to haſten the cure.

If the wound be of any length, you may ſtitch it in three or more places, but be ſure for to leave a place at the lower part thereof, for to purge it ſelf thereby.

RECEIPT LXXI.

An excellent Unguent, or Liniment for green Wounds, eſpecially for thoſe in the head.

TAke of the beſt Turpentine an ounce and a half, and as much of Gum Elemi, of Capons-greaſe an ounce, melt theſe at the fire, and mingle them. When you uſe it, melt it, and annoynt the edges of the wound, and dip a pledge of lint in it, and then lay a plaiſter on the top of the ſame, and roll it gently.

RE-

RECEIPT LXXII.

How to make a soveraign Oyl, or balm for all wounds simple or confused.

TAke three pound of common Oyl, two pound of Turpentine, wheat that is cleansed five ounces, Saint *Johns* wort a pound, Valerian, Carduus Benedictus, of each fourteen ounces; bruise the Hearbs, and infuse them in white-wine six or eight Houres, then put thereto the Wheat and Oyl, and boyl them on an easie fire, till the wine be consumed; then strain them, and put the Turpentine in, and then boyl them again on a soft fire to perfection.

RECEIPT LXXIII.

An excellent Emplaister, which is good for all wounds or Ulcers.

TAke Deers suet four ounces, Rosin, and Perrosin, of each a pound and a half, white wax, and Frankincense, of each four ounces, Mastick an ounce; melt the wax and suet, and powder the gums, and put them together, and when they be melted, strain them through a piece of Canvase, then add to them a pottle of white-wine, and boyl them all to the composition of the wine, with continual stirring, and then take it from the fire, and when it is almost

cold, put thereto four ounces of turpentine washed in white wine, and of camphire powderd two ounces; then make roules of it and keep it for your use.

RECEIPT LXXIV.

Another excellent Plaister for Wounds in the Breasts, or other parts.

TAke Rosin that is fresh, clear and sweet, a pound, Oyl of Bayes, and turpentine, of each two ounces; Gum Elemi sweet and good four ounces; melt the Rosin and Gum together, and stir them well; then put in the Oyl and turpentine, and let it boyl, with continual stirring, and then strain it, and reserve it for your use in a close pot.

When you use it spread it on a piece of leather, bigger than the wound by three fingers breadth, and make a hole in the middle of the leather for the corruption to run forth, this doth it without tent or pledget, dress it twice a day in the Summer, and once a day in the winter.

This plaister is good for all wounds in the breast, or other parts, for it draweth the hollow parts of all wounds, and strengthens the parts, clearing them from unnatural matter, and dryeth all wounds caused by thrusts.

RE-

RECEIPT LXXV.

Of the general significations of sicknesses, either present or near at hand.

THese following Presages and tokens of sicknesses are worth the observation of all men; First, to prepare themselves for God, if he be pleased to call them otherwise that they may in time, before they be too much spent, have the counsel and help of learned and expert Physicians.

Signs of Sickness are these.

If the body be hotter, colder, moyster, dryer, leaner, fatter, or the colour more pale, or more swarthish, or the eyes more hollow than they were accustomed to be, and on the sudden change, all these are certain fore-runners and messengers, that the body is disposed to sickness, or already sick.

RECEIPT LXXVI.

Of the signification of the several colours of some Urines.

THe colours and Symptoms of Urines are many and various, as are the Diseases, and therefore ought to be judged on by the learned: but thus much in brief.

Red and thick urine, betokeneth sanguine.
Red and thin, betokeneth melancholy.
White and thick, signifieth flegm.

White and thin, betokeneth melancholy.

The highneſs of the colour ſignifieth heat, but the pale, black, or green, betokeneth cold.

Alſo, the groſneſs, or thickneſs of the urine ſignifieth moiſture, the clearneſs, or thinneſs, dryneſs.

Urine of the colour of bright Gold, or of the colour of Gilt, ſignifieth perfect digeſtion, or health.

Red as a red Apple, or Cherry, or baſe red like bole Armoniack, or red like glowing fire betokeneth exceſs of digeſtion.

Clear and white like water, or gray as a horn, or white like whey, or the colour of a Camels hair, ſignifieth lack of digeſtion.

Pale, like to broth, or fleſh ſodden, betokeneth the beginning of digeſtion.

Citrine colour, or yellow, ſub-citrine, or paler, ſignifieth the middle of digeſtion.

Colour of a Beaſts liver, or of dark wine, or green like to Cole-worts, ſheweth aduſtion of humours.

Urine of a leady colour, or black as ink, or black as horn, or dark above, and clear beneath, betokeneth feebleneſs of nature, mortification, and death.

The

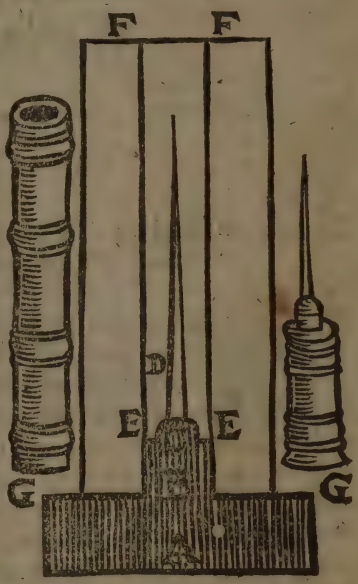
The School of Artificial Fire-Works.

FIRST.

The order and making in a true proportion all sorts of Moulds for Fire-works.

BEfore you proceed to the making of Rockets for Fire-works, it is requisite to understand how to order, and make your Moulds and other instruments for the same, and first for your moulds You must provide a piece of good dry Box, Holly, Walnut-tree, Crab-tree, or some such like tough wood, without shakes or knots, and when you have thus done, it is fit to know of what length and breadth you desire to have your Mould, for following this kind of proportion, all other sorts of moulds are made great and small, therefore you ought to have a Turner to turn and bore the same: as for example: I would have the hole of a Mould bored but an inch diameter, or wide, then the length of the Mould must be six times so long as the hole is wide (which is six inches) and on each side of the hole half an inch thick: So that when the Mould is

turned round, it is two inches over in breadth. When you have done this, you must have a bottom made and is to be fitted in this manner, as is described by the letters in the Figure following.



A. Is the foot of the Mould, and must be in height two inches, and must be in breadth an inch and a quarter, whether it be square or round.

B. Serveth only for a stay, and must rise one inch into the Mould, and so porportionable in all other moulds.

C. Is for the mouth of the Rocket, and is in breadth two third parts of an inch, and then setting one foot of a pair of Compasses in the middle or center, describe the arch, which is the full height required.

D. Is the length and bigness of the Needle, which is two third parts, the length of the mould and the bigness of the bottom one sixth part, the breadth of the bore and taper toward the top.

F. E. Serveth for the Paper being rouled, and must be one sixth part of the breadth on each side.

F. F. Is

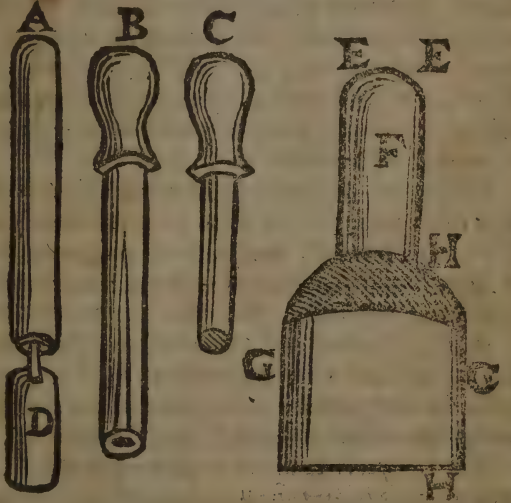
F. F. Is the thickneſs of the mould, which is half the breadth of the bore, that is in this mould half an inch.

F. G. Is the length of the mould, which is ſix times the breadth.

---

2. *The order and making of Rowlers, Rammers, and other things for the Coffins.*

HAving provided your mould, then you are to fit your Rowler, which muſt be two third parts of the breadth of the bore of the mould, and the length thereof ſix inches longer than the mould, which is for rouling of your paper, and is deſcribed by the letter **A** in the figure following, with a hole to be



bored in the bottom to receive a Wyre, which muſt

be faſtned in another piece of wood ſome-what ſhorter, to take out at your pleaſure, which is deſcribed by the letter D, the uſe thereof ſhall be deſcribed, when I ſhall ſhew the order of making the Coffins.

When you have fitted your rocket, then proceed to the making of your rammers, which muſt always be two at the leaſt, for each ſeveral Mould as they increaſe in largeneſs, ſo you muſt be fitted with ſeveral rammers, by reaſon of the Taper Needle: the manner and form is deſcribed by the letters B, C, in the figure following.

B. Is the hollow rammer, and hath a hole in it anſwerable to the length and bigneſs of the Taper Needle, it muſt be a ſmall matter leſs than the rowler, becauſe that otherwiſe in putting it in, you will put down the paper. The other rammer is not half ſo long, and ſad, that when you have beaten to the top of the Needle, you may make uſe of this, which is marked with the letter C.

Having fitted your rammers, provide a piece of Box made after the form as you ſee deſcribed by the letter F, which muſt ſerve to make your large Coffins, to put the work which you intend, on the head of your rockets.

E. E. Sheweth the breadth, which is the juſt bigneſs of the rocket, and muſt be ſo in all ſizes.

G. G. Deſcribeth the largeneſs of the Coffin, and muſt be twice the breadth of the Rocket.

The Letters H, H, ſheweth the length of the Coffin which ought to be twice the breadth of the rocket, but you are not tyed to that ſo preciſely, becauſe

you

you may alter that according to the work which you put therein.

3 *How to order, and make the Coffins of paper.*

HAving explained the manner and form of the moulds, with the other things belonging to the ſame; I will now ſhew the uſe of them in their ſeveral orders: and firſt for the uſe of the Rowler, deſcribed by the letter A. in the Figure before.

Provide you ſome good large ſtrong Paper for your work: and to know what length your Paper muſt be, let it be always the length of your mould, ſo ſhall you have one breadth left above the mould, the uſe whereof ſhall be ſhewed hereafter. Now having provided your Paper in length ready, take your rowler and one length of Paper, and begin to roul; when you have rouled one ſheet you muſt have a board with a handle, to roul it with, (the board is marked in the Figure following with the letter B.) which muſt be done in this manner: you muſt hold the rouler in your left hand, and with your right hand hold the board by the handle, and then lay down your rowler upon ſome ſmooth cheſt, or table, which when you have done, roul another length of Paper, and ſo proceed in rouling between every ſheet, untill you have rouled on ſo much, as will fill the mould very ſtreight. When you have thus done, draw forth the rowler about an inch, and then take the other ſhort rowler, which is marked with the letter D. in the other Figure, and put it in as you

ſee

see described, and there you shall have a place left for the choaking of the rocket, of which is next following.

4 *The order and manner how you shall choak a Rocket.*

WHen you are to choak a Rocket, you must have an Iron hook, or a staple driven into some post, to which you must fasten your cord, which must be bigger or less, according to the bigness of your Rocket, by reason that a small cord will not choak a great Rocket for want of strength and a great cord will not serve for a small one, in regard that it will make too great a choaking, so that you must have a bigger and a less; and when you have so done, you must tye one end of the cord to the hook or staple, and at the other end, about a yard off, tye a strong stick, in fashion of a swing, it must be

be ſtrong becauſe it beareth the weight of the body, (as you may ſee in the Figure following, marked with the letter K) which when you have provided put the ſtick between your leggs, and wind the cord about the Rocket-caſe in the place appointed, which muſt be between the long rowler and the ſhort, when that is done, girt it by degrees, ever turning the rowler, to the end it may come together more cloſe and neat, and when you have ſufficiently choaked it, draw forth your ſhort rowler, and where the choaking is, tye it about with ſtrong Pack-thread, and then draw forth the rowler, your Coffin is re dy to be filled when occaſion ſerveth, the form whereof followeth, by this letter **A.**

5. The

5 *The manner of driving a Rocket, with the Instruments belonging thereto.*

YOur Coffin of Paper being finiſhed, take it, and with your hollow Rammer, force the ſame down cloſe into the mould, and when you have done, ſtrike two or three hard blowes to ſettle the Paper into his righ form: Which being done, then you muſt fill the Coffin, in doing whereof you muſt have a care, poviding a meaſure which may contain but the twentieth part of your whole Rocket; ſo by that means you ſhall not fail, but every Rocket ſhall have a true proportion alike: as for example; I have a Coffin, which being filled, will hold an ounce of mixture, or thereabout: then I take the twentieth part, & when I find what quantity it is, I make a meaſure of horn or Lattin marked with the Letter F. which ſhall contain ſo much, and then I begin to fill my Coffin with one meaſure at a time, and puting in my Rammer, I ſtrike four or five ſmart blowes with a good heavy mallet, and then fill another meaſure, and ſtrike again, ſo I continue till I come to the top of the needle, then I take the ſaid Rammer, and ſo continue with it, till I come to the top of the mould: now the paper which is above the top of the mould muſt be turned down and beaten hard: which being done the rocket is finiſhed from the mould, which being forced out with as much eaſe as you can, for the leſs you force it, (being filled, and the Needle taken out,) the better it is, for knocking looſens the Powder, & ſo cauſes the Rocket for to fail. You ſhould have a Funnel to fill your ſmall rockets, which is marked with the letter G.

6 *Of*

6. Of the Compoſition and Receipts for your Rockets.

HAving thus finiſhed your Rockets, it now reſts to know the Receits: For in the making of them, the chiefeſt thing to be regarded is, the comopſition that they ought to be filled withall: foraſmuch as that which is proper to Rockets which are of leſs ſort, is very improper to thoſe which are of a greater ſize: for the Fire being lighted in a great Concave which is filled with a quick compoſition, burns with great violence: and ſo contrary, a weak compoſition being placed into a ſmall Concave, maketh no effect: Therefore we ſhall here deliver Rules and directions, which may ſerve for the true compoſition, or matter wherewith you may charge any Rocket; from Rockets which are chargedbut with one ounce of powder, unto greater, which require for their charge ten pound of powder: and here follows the ingrediences for ſeveral rockets.

First,

First, for Rockets of one ounce.

Unto each pound of good musket powder beaten, put two ounces of small-coal duſt, and with this charge the Rocket.

For Rockets of two or three ounces.

Unto every four ounces and a half of powder-duſt add an ounce of Salt-peter, or to every four ounces of powder-duſt add an ounce of Coal-duſt.

For Rockets of four ounces.

Unto every pound of Powder-duſt, add four ounces of Salt-peter, and an ounce of Coal-duſt, but to have it more ſlow, unto every ten ounces of good powder-duſt, add three ounces of Salt-peter, and three ounces of Coal-duſt.

For Rockets of five or ſix ounces.

Unto every pound of Powder-duſt, add three ounces and a half of Salt-peter, and two ounces and a half of coal-duſt, and an ounce of Sulphur, and an ounce of File-duſt.

For Rockets of ſeven or eight ounces.

Unto every pound of Powder-duſt, add four ounces of Salt-peter, and three ounces of Sulphur.

For Rockets of ten or twelve ounces.

Unto the former Ingredents, add half an ounce of Sulphur, and it will be ſufficient.

For Rockets of fourteen, and ſixteen ounces.

Unto every pound of powder-duſt, add four ounces of Salt-peter, of Coal-duſt two ounces and a quarter, of Sulphur and File-duſt, an ounce and a quarter.

For Rockets of one pound.

Unto every pound of Powder-duſt, add three ounces of Coal-duſt, and an ounce of Sulphur.

For

For Rockets of two pound.

Unto every pound of Powder-duſt, add nine ounces and a half of Salt-peter, of Coal duſt two ounces and a half, of File-duſt one ounce and a half, and of Sulphur three quarters of an ounce.

For Rockets of three pound.

Unto every pound of Salt-peter, add ſix ounces of Coal-duſt, and of Sulphur four ounces.

For Rockets of four, five, ſix or ſeven pound.

Unto every pound of Salt peter, add five ounces and a half of Coal-duſt, and of Sulphur two ounces and a half.

Here note in that in all great Rockets there is no powder put, becauſe of the greatneſs of the Fire, which is lighted at once, which cauſeth too great a violence, and therefore ought to be filled with a more weak compoſition.

Now when you have provided your Powder, you muſt firſt meal it, and then ſearce it, ſo that it may be free from any corn, though never ſo ſmall. Likewiſe take good dry coal, well burnt, and beat it to duſt: ſearcing it very fine, which when you have done, mix them according as your occaſion requireth, and follow your directions.

7 The manner of heading a Rocket, with the order of capping it.

IN the manner of heading a Rocket, you must use the thick Rowler, which you may see described by the latter F. in the second figure: upon which you must rowl some paper, or fine Paste-board, and past it so that it may be very close, and then choak it at the length of the thicker part, so that it may come close to your stick in the lesser part, which will be fit to be tyed to the top of the Rocket: so shall you have a Coffin to put in your works, which must be of divers sorts. This being done you must provide taper Caps, which must be joyned to the top of the large Coffin: The use of them is to keep in your works, & to cause them to pierce the Air more swiftly. The manner of making these Caps, is to take a pair of Compasses, and describe a circle in a Past-board; then cut it out with a pair of Sheers, and that will make two caps, being cut in the middle, and turned one corner under the other, and so pasted: and let them so pasted, be put in a Napkin-press till they be dry, and when they be dry, cut out a half circle in Paper, which shall sit round about the said cap, and shall serve to paste on the cap to the coffin; So you have all things ready to the finishing of your Rocket, which must be done in the manner which followeth. R. in the next figure, is the crackers fastned to the top of the Rocket, S. is the cap, T. is the Fisgigs finished, H. is the stick tyed to the Rockets.

8. The

8 *The manner of faſtning a Rocket.*

HAving driven your Rocket, as I have ſhewed, with the Paper turned down, you muſt firſt prime it, which muſt be with cotten wick made for that purpoſe, which you muſt put into the vent, leaving a piece to hang lower than the mouth of the Rocket by three or four inches; which being done, tye a piece of Paper over the mouth, that it may not fall out. Now having primed your Rocket, you may proceed to the heading of it, and that is done after this manner.

Take your Rocket, and on the head you ſhould turn down the Paper, you muſt with a Bodkin pierce two or three holes, that when the Rocket hath ſpent it ſelf, the works which are in the head may take fire; which holes prime with a little Powder-duſt, and then put on the head, with the choaking fitted to your Rocket, which muſt come over the ſame in ſuch manner, that the bottom of the greateſt part muſt come even with the top of the Rocket; which tye faſt to the Rocket with thread, and then put in your works; but before you put in your works, whether they be Stars, or any other works, you muſt put in a little cotten-wool, being rouled in Powder-duſt, to make your Stars to take fire, or likewiſe may blow out: Having thus done, put in your Stars, or other works, and if you make more than one fire, (as you may

do of your Stars) then you must put more Cotten rouled in powder-dust among them, or between every tire, that they may all take fire; then take your Cap, and fill the hollow place with Cotten, because it is light, and likewise will fire quickly; which being fitted, paste it close to the top of the coffin, that it may stand upright; then must you fit your stick, for the poysing of your Rocket, which ought to be eight times the length of the Rocket without the head: You must get the smoothest and lightest you can, such as Basket-makers use, and then cut one side of it flat at the great end, then make two notches on the round side, that the one be differing from the other, so much as is between the choaking of your Rocket, and the end of the Vent; for if you should tye it upon the Vent it would loosen the Powder, causing it to break in the Firing: be careful that you tye not the wrong end of the Rocket uppermost, but tye that end downward that is choaked, and with a piece of thread that is strong, tye it to the lower notch about the choaking. When you have tyed that, then tye the other higher, and let the stick come even with the top of the Rocket, the manner whereof is shewed in the next figure, by the letter G. Then poyse your Rocket, by laying it on your finger two or three Inches from the mouth; and if you find the stick be too heavy, cut it shorter, till you find your rocket to ballance your stick, for if the stick be too heavy, the rocket will be a slug, and being too light, the rocket will fall before it be half up. These things being provided, you have your rocket ready to be fired, which must be after this manner following.

9 *The manner of firing Rockets, with the description of a Staffe for the same.*

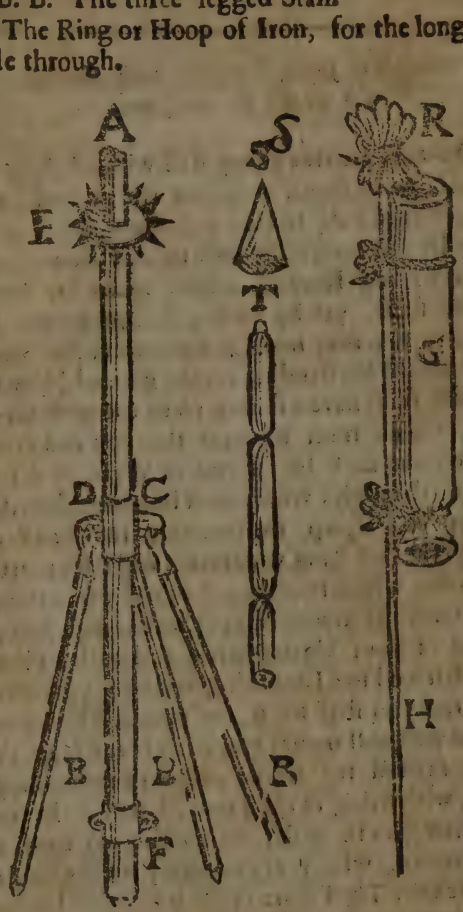
YOu must provide a long staff, with a Pike at one end, to be thrust hard into the ground, with a three-legged staff, having a hollow hoop at the top, to let this long staffe slide up and down, to the end that having Rockets whose sticks are longer than the staffe, yet by raising it through the said Iron hoop, you may make it four or five foot longer than it would be, standing on the ground. Now this long staffe must have a sliding place cut with several points, which must be near the top; and at the bottom there must be a ring of Wyre, to let the stick go through; which must be made likewise to slide up and down, so thrusting the small end through the said Ring, your rocket will rest upon that part above, which must be just opposite in a streight line; so open the mouth of your rocket, and pull out the end of your Cotten-wick, and with a piece of Match fastened in a Linstock, give fire to the wick and by degrees you shall see it fire your Rocket; which ordered well, will mount very streight and high. Thus having shewed the whole order of composing a rocket, with firing of the same, I will in the next place shew you the order for making of stars, and other works, which are necessary for the heads of your rockets. The Figure of the rocket and the staffe are here presented.

The Letter G. is the rocket with the long stick.

A. The long Staffe to rise through the ring.

B. B. B. The three legged Staff.

C. The Ring or Hoop of Iron, for the long staff to slide through.



D. The Screw to fasten to the long staff being raised. E. A

E. A piece of Iron filled with notches to hang the Rocket on.

F. The Ring of Wyre to put through the ſtick, to be raiſed higher or lower.

G. Is the Rocket.

H. The long ſtick.

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10 *Several compoſitions for the ordering of Stars of ſeveral colours.*

IF you will have your ſtars of a blew colour with red, then take eight ounces of Powder meal-ed, of Salt-peter four ounces, and of Sulphur vive twelve ounces: Meal theſe very fine, and mix them together with two ounces of Aqua vitæ and half an ounce of the the Oyl of Spike, and let it be dry be-fore you uſe it.

If you will have a beautiful white Fire, take four ounces of Powder, twelve ounces of Salt-pe-ter, ſix ounces of Sulphur vive, and half an ounce of Camphire: meal your ingredients and mix them. Now to powder your Camphire, you muſt uſe a Braſs mortar and a peſtle, dipping it in Oyl of Al-monds, ſo ſtirring it by degrees it will powder, and then keep it cloſe from the Ayre till you uſe it, or the Camphire will loſe its ſpirit.

If you will have a white Fire, and to laſt long, then take four ounces of Powder, one ounce of Salt-peter, eight ounces of Sulphur vive, one ounce of Camphire, and two ounces of Oyl of Peter:

meal those which are to be mealed very fine, and mix them according to the former directions.

11 *The order and manner of making the best sort of Stars.*

HAving shewed the Composition for Stars, now I will shew you how to make them, which is thus: You must make little square pieces of brown paper, which fill with your composition, and so double it down, rouling it till you make it somewhat round about the bigness of a Nut or bigger, according to the size of the Rocket, you may put in a dozen on the head of a small Rocket, binding them round with a thread, and then draw a cotten wick through them, being prepared for priming.

Also there is another way which is thus; take a small Rowler, about the bigness of an arrow, and roul a length of paper about it, and paste it round, letting it dry, and then you have a hollow trunk of this paper, fill this with your ingredients, thrusting it hard till it be at the top, and then cut it into short pieces, about half an inch long, and then in warm glew dip one of the ends therein, and let them drie to the end that both ends of your Stars fire not, and then put the other end into Powder-dust; you may put them on your Rocket, in one or two tires, putting in Powder-dust between every fire, that they may all take fire.

The priming is thus made; Take Oyl of Camphire soaking cotten wick therein, and being moyst roul

roul it in fine Powder-duſt, and then hang it up till it be thorow dry, and then keep it cloſe from ayre till you uſe it, or the ſpirit of the Camphire will decay.

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12 *The order and making of other ſeveral Fire-works for the Rocket, as Serpents, or Fiſgigs, Reports, Golden and Silver Rain, &c.*

THe Serpents or Fiſgigs are made about the bigneſs of ones little finger, by rowling a paper upon a ſmall rowler, (as it was for your Stars) and choaking the paper Coffin an inch from the end, then fill it three inches with Powder-duſt, and then choak it, and then put in a little corn powder, when your ſerpents have played a while to and fro, it may break and give report: you may fill it with the Star mixture, and putting divers of them on the head of the large Rocket, they will firſt appear like Stars, and when the Stars are ſpent, take hold of the powder-duſt, and they will run rigling to and fro like Serpents, and at laſt will give ſo many reports, very delightful to behold.

The reports are made in their proper caſes as the Serpents are, but the paper muſt be ſomewhat thicker, which will cauſe it to give the greater report; Theſe are to be filled with grane powder, or half powder and Star mixture.

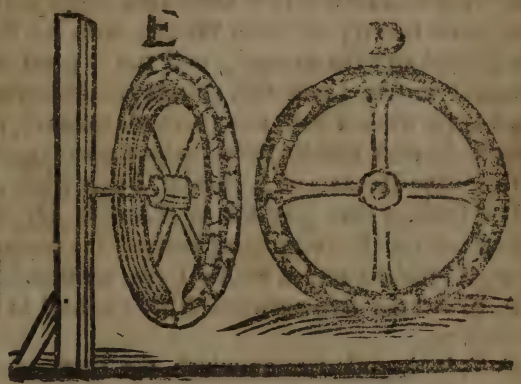
To make the golden Rain, you muſt get ſtore of Gooſe-quils and cut them off next the feathers, and fill theſe quils hard with the ſame compoſition that

is in your Rocket, and muſt be put on the head of the Rocket with the open end downwards: If it were poſſible to put a thouſand of theſe quils upon the head of a Rocket, it were a dainty ſight to ſee how pleaſantly they ſpread themſelves in the ayr, and come down like ſtreams of gold much like the falling down of Snow, eſpecially if the wind be any thing high.

If you will make ſilver Rain it is performed as the other, only you muſt fill your quils with the ſame ingredients that you did your white Stars.

13 *How to make your fire-works to run upon a line backward and forward.*

TAke ſmall Rockets, and place the tail of one to the head of the other, tying a Cane to them to run on a line ſoped; the line may be a hundred yards long, or longer if you pleaſe, being well ſtretched and ſet on ſtakes, as you may ſee in the figure following; as admit the line to be ABCDEFG. and if you give fire to the Rocket at A, it will fly to B, and then come back again to A. Then fire another to C and that will fly to D, and back again



to C, and ſo of the reſt: And at the laſt (if you pleaſe) may be placed a pot of Fire-works, which being fired will make good ſport, having Serpents and other things in it, which will variouſly intermix themſelves

themſelves in the air, and upon the ground, and every one will extinguiſh it ſelf with the report.

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14 *How to make a Wheel of Fire-works to run forward and backward upon the ground.*

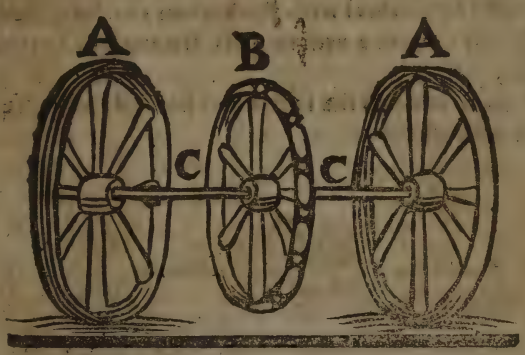
YOu muſt get a pair of light Wheels like ſpinning Wheels, both of a bigneſs, which muſt be faſtned to a ſmall light axle-tree, in ſuch manner, that they may not move about the ſame, and on the middle of the axle-tree, faſten alſo a Fire-wheel (as you may ſee in the Figure following) which muſt not be ſo big in compaſs as the two other wheels, becauſe it muſt not touch the ground, ſo that being faſt in the middle upon the ſame axle-tree, it cannot run unleſs it carry the other Wheels with it; theſe bing ſet on an even ground, will run a great way without ceaſing: now that you may make it return back again when it hath run its courſe forward, you may make your middle Wheel in ſuch manner, that it may have Rockets on both ſides, ſo that when one ſide is ſpent, it may give fire to the other ſide, the mouths of the Rockets being faſtned the contrary way will make a return with a ſwift motion.

A. A. Are the two outward Wheels faſtned to the axle-tree.

C. C. Is the axle-tree on which the three wheels are all faſtned.

B. Is

B, Is the Fire wheel in the middle, and carrieth it not ſo great a compaſs as the other two wheels.



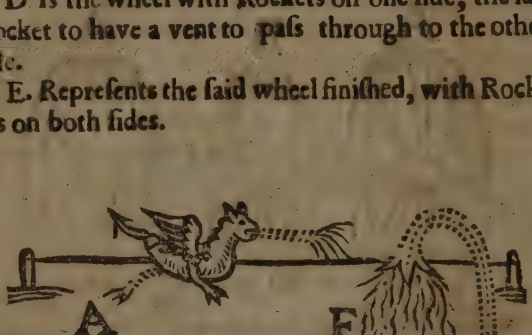
15 *Another way for a ſingle Wheel to be placed on a poſt to turn both ways.*

THis may be performed with a ſingle wheel ſo that the Rockets may be placed on each ſide (as in the other middle wheel with a hole from the one ſide to the other for a vent; then place your Rockets firſt upon one ſide (but ſo that the laſt Rocket be placed over the ſaid hole) and boring a ſmall hole in one ſide of the laſt Rocket, put in a cotten wick for priming, letting it come through the hole in the Wheel, to the mouth of another Rocket which ſhall be turned the contrary way on the other ſide; ſo that the wheel having finiſhed its revolution one way may take fire on the other ſide, making a retrograde

a retrograde motion: but if you place the Rockets all one way on both sides, it will continue twice so long as another of the same bigness, the form of which is expressed in the Figures following.

D Is the wheel with Rockets on one side, the last Rocket to have a vent to pass through to the other side.

E. Represents the said wheel finished, with Rockets on both sides.



16 *The order to make a fixed wheel, standing upon a Post, giving divers reports.*

THere must be a wheel turned two foot wide, and out of the upper side must be a groof turned half an inch wide and half an inch deep, to which

which groof you muſt have a piece of wood ſo fitted, that it may juſt ſlide in, which piece of wood muſt have ſo many ſmall holes bored in it as you will have reports about it, and be ſure you ſet them not too near together, leſt the fire of one beat the other down; having thus provided your wheel, you muſt make a conveyance orhol low Trunk of paper, which will juſt fill it, and fill the ſame with ſome of your ſlow mixtures of ſtars, and then putting on the cap of wood ſo fitted with holes, being made faſt with glew, pierce every hole into your hollow conveyance ſo that putting a quill into every one, they may take fire, and to the quill faſten a Report; ſo ſhall you have a peal of Chambers placed in a ſmall room, which being once Fired, will follow in order, till the whole train be ſpent. Behold the Figure marked with A.

17 *Another fixed Wheel upon a post, which will cast forth many Rockets into the Air.*

THis Wheel is not much unlike the former, which will give Fire to divers Rockets ſtanding circular, differing little from the former, only you muſt make a hole for every ſtick to paſs thorow, as it is in the Figure B. and therefore it muſt be made ſomewhat broader, which will work the like effect that the other doth, by conveying Fire from one Rocket to another, till they be all ſpent.

The mixture for this conveyance muſt be very ſlow, therefore uſe theſe Ingredients: Take eight ounces of Roch peter, four ounces of Sulphur vive, half an ounce of Camphire, two ounces of fine Powder-duſt, and meal theſe very fine, and mingle them together, adding half a quarter of an ounce of Linſeed Oyl, and as much of the Oyl of Peter theſe Oyles muſt be dropped in by degrees, and ſo wrought up, till you find your mixture bound like Dough, and this is both ſlow and ſure.

18 *Another*

18 *Another dainty fixed Wheel, which will cast forth divers Fisgigs, or Serpents, and as many Reports.*

YOu must have a Wheel turned with a groof on the top thereof to put in the conveyance of paper,

per, then fit on a piece of wood (as it was before shewed) with small holes to put in quills, which are for Firing your reports, and must be placed round about the upper part of your wheel, and on the side thereof divers holes must be made of the bigness of your Fisgigs, which must be pierced through to the paper conveyance, those Fisgigs that are placed round on the sides and the reports on the top one train will Fire them all; and in firing you shall see all the Fisgigs flying round about, one after another as the fire passeth to them; and for every Fisgig which passeth out shall be fired a report; so that there shall be a continual motion, until the whole train be consumed.

G. Is the Wheel with reports and Fisgigs.
R R. Is the Reports on the upper part.
F F. Is the Fisgigs on the side of the Wheel.

19 *Of Night Combatants with Faulchions and Targets, Clubs, Maces, &c.*

THis is performed by two men seeming to fight, or to make way in a throng of people; the Clubs at the great ends are made like a round basket (or other form) with wicker, or small sticks on a staff, which must be filled with Rockets in a spiral form glued, and so placed that they Fire but one after another: The Faulchions are made of wood in a bowing manner having large backs to receive many Rockets, the heads of one near the neck of another, glewed and fastned well together, so that one being spent, the other may take Fire: The Targets are made of thin boards, which are chalkened in spiral Lines to contain Primers to fire the Rockets one after another, which is all covered over with a thin covering of wood or past-board, bored with holes spiral also, which Rockets must be glewed and made fast to the place of the channels: Now if two men have in each hand a Target and a Faulchion, or a Mace of Fire, and seem to fight, it will appear very pleasant to the Spectators; for by the motion of fighting, the place will seem to be full of streams of fire: And there may be adjoyned to each Target a Sun or burning Comet, with Launces of each fire, wich will make them more beautifull and resplendent in that action.

20 *Another dainty one with Fisgigs, called Jack in a Box.*

THe manner of making the same is in this order, cause a box of Plate to be made about six inches deep, and of what compass you please (with a socket at the bottom to put in a staffe) then putting in a quantity of corn-powder, or powder-dust in the bottom of the box, you may fill it with Fisgigs or Serpents, leaving a place in the middle for a Cane to go through the bottom, which Cane must be filled with a slow receit, in which you must put a quan-

a quantity of Camphir, but no Oyls, in regard of the narrow paſſage it hath to burn, without any other vent; then put your Cane down; leaving it an inch above the box, and take a thick piece of paſt-board cutting a hole for the Cane to paſs through, and glew it cloſe to the Cane that the Fire paſs not through before its time: this paſt-board muſt be of ſufficient breadth to cover the box quite over, then put it on a ſtaffe and light your Cane which will appear only like a Candle, and after a little ſpace of time you ſhall hear a ſudden noyſe, and ſee all thoſe Fiſgigs flying ſome one way, and ſome another: This hath given good content to the beholders, you may if you pleaſe make Clubs or Maces of the ſame.

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21 *Of Pots of Fire for the ground, which will make the Air rebound with their reports.*

MAny Pots being fired together, do give a fine repreſentation and recreation to the ſpectators; for thoſe pots being filled with balls of fire, or flying Serpents for the air, will ſo intermix one within another in flying here and there a little above the ground, and giving ſuch a volly of reports, that the air will rebound with the noyſe, and the whole place be filled with ſundry ſtreams of pleaſant fire; which Serpents will much trouble thoſe near the place to defend themſelves in their upper parts; and they will be no leſs bufied by the balls of fire which will ſeem to annoy their feet.

22 *The making of a Fire-ball for the ground, which will be in continual motion.*

YOu must get a ball turned of some light wood, and then let it be sawn through the midst with a thin bow-saw, then make on each side a hollow groof to lay in two Rockets (joyned together after the manner of the Runners) and then close up your ball with glew; only in the place where the two Rockets joyn shall be a groof, which must be pasted over with paper, that the second Rocket taking fire may have a vent, otherwise the ball will serve but once, then fire it and you shall see the operation with pleasure.

23 *The making of a Ball for water which shall burn, with great violence.*

SOw a round Case of strong Canvas, in shape of the case for a Foot-ball, but somewhat lesser, and very round; having thus made your case, then proceed to the filling of it, which must be done in this manner: You must first put in three or four good spoonfull of your mixture following, and with a stick made round at one end, force it close together, and so continue filling it, and between every filling put in your stick, and force it together, round it continually in your hand till you have finished it; which having done, sow it up close, and then arm it with small cord, which is called marling; after you have thus done, you must coat it with a quantity of Rosin, Pitch and Tallow to dissolve, and dip your ball all over in the same, provided that you leave two vents to fire it, which must be pierced a third part into your ball, which must be stopped with two small sticks, till such time that you come to use them, the form thereof you shall see in the next figure by the Letter D, then pulling forth the sticks, fill the two vents with fine powder-dust, and firing it, cast it into the water; and you shall have your desire; but you must alwayes be sure that your ball be throughly fired before you cast it from you: The Receipt for this ball followeth.

Take one pound of Powder, eight ounces of

Roch-water, four ounces of Sulphur, two ounces of Camphir, one ounce of oyl of Peter, one ounce of Linseed Oyl, half an ounce of Oyl of Spike, and two ounces of Colophonia.

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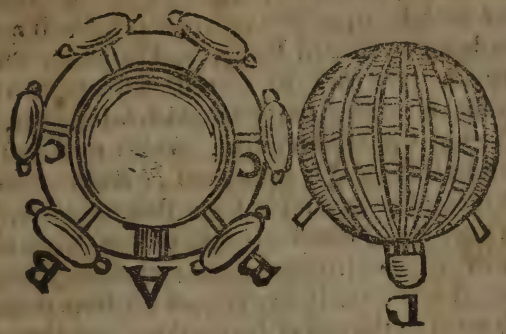
24 *Another dainty Water-ball, which will shoot forth many Reports.*

THis Ball must be made of wood (as was shewed before)in two pieces,because you may joyn it close together at pleasure, having small holes bored round about it, to put in your quills which justifie the Reports, which reports or breakers must be made of paper, choaked at both ends and primed through the midst ; they must be fastened round with pitch, and so covered round about,that no water may pass in : you must fill this ball in two halfs, that you may force it very close together, and when it's filled , glew it fast,and arm it well with nealed wyer, then put in your breakers, with a quill which must enter into the ball, and likewise into the breaker ; the form whereof you may see in the Figure following : For A. is the mouth of the ball where it is to be fired, B. B. are the reports or breakers, being made of paper, and filled with Corn-powder : C. C. are the Quills,which must be filled with powder-dust, and serveth for firing the Reports.



The Receipt for this ball are these; Take one pound of Roch-peter, four ounces of powder-dust, three ounces of Sulphur-vive, two ounces of Camphyr, one ounce of Linseed-oyl, two ounces of Rosin, and one ounce of Oyl benedict, you must powder those things which are to be powdred, and mingle them all together, and by little and little sprinkle your Oyls, till you have wrought it like Paste, and then use it: the quills must be filled only with powder-dust, because it must fire suddenly.

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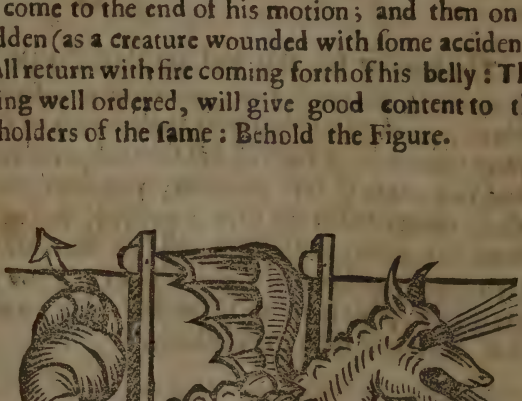
25 *How to make a Dragon, or the like, to run on the Line, spitting of fire.*

THe body of the Dragon must be made either with Past-board, or with fine rods of wicker, being hollow, with a place in the belly to put in two Rockets, and must be so ordered, that there

may come a ſmall Pipe from the tayl of the one, to the head of the other: then make a place for the eyes, and mouth, to put into each hole fire, which muſt be made up in rouled Paper, and thruſt in, then on the top of the back, let there be faſtened two ſmall Pullies for a Line to run in, which being done, your Dragon is finiſhed for firing, which muſt be thus: firſt ſet it at the eyes and mouth, (always obſerving that this receipt muſt be ſome ſlow mixture, ſuch as your ſtars) then fire that Rocket which is placed with his mouth towards the tayl of the Dragon, which will make it ſeem to caſt fire from thence till he come to the end of his motion; and then on a ſudden (as a creature wounded with ſome accident) ſhall return with fire coming forth of his belly: This being well ordered, will give good content to the beholders of the ſame: Behold the Figure.



26 *The manner and form to repreſent Saint* George *fighting with a Dragon in Fire, on the Line.*

WHen you have formed your Figures of Paſt-board, or Wicker (as aforeſaid) you muſt make a hollow trunk through the body of each Figure, for a great Line to paſs through, and likewiſe for a ſmaller Line to draw them to and fro from each other, which muſt be faſtned in this manner (as you may ſee in the Figure following:) At the breaſt of the Dragon let one end of one cord be tied, which muſt paſs through the body of the George, and turning it about a Pulley at the other end, faſten it to the back of the George, and at the breaſt of the George let another cord be tyed, which muſt paſs through the body of the Dragon (or a trunk on the back) and ſo returning about a Pulley at that end, muſt be pulled ſtreight and faſtned to the tayl of the Dragon, ſo that as you turn that Wheel the George and Dragon will run furiouſly at each other: and when you pleaſe, you may cauſe them to make a retreat, and come on again: but by all means forget not to ſcope your line extraordinary well, and likewiſe have a care that your work be not too heavy above line, but that they may hang in an equal ballance, otherwiſe they will turn their heels upward, which will be a great diſgrace to the work and Work-man: And thus much to the ingenious I ſuppoſe will ſuffice: behold the Figure.

27 *How to make a Whale, a Mermaid, or other to play and ſwim upon the water.*

YOu may make Figures of what ſhape your fancy beſt pleaſeth: the body muſt be made of light wicker rods, and in the midſt of the body let there be placed an axel-tree, having two Wheels coming into the water, yet ſo as they may not be ſeen: theſe Wheels muſt be made hollow, to contain a quantity of ſand or water: the uſe of it is to keep the body of your Figure upright, and able to ſink it ſo far into the water as is needfull, and likewiſe to make it ſwim to more ſteady: note that theſe Wheels muſt be looſe, and the axle-tree faſt: in the midſt of this axle-tree, place three or four great Rockets one by another, with their mouths all one way: yet ſo provided that there may be ſuch a diſtance between each Rocket that there may come a vent from the tayl of the firſt to the mouth of the ſecond, and from the ſecond to the third. And to the end that it may continue the longer in motion, you may place divers lights about the body

Body, to make it the more beautiful; every of which lights extinguishing shall give a report, and so conclude. There are divers other fine Works to be performed on the waters, which a judicious Artist may invent.

The Letter B. represents the Mermaid.

C. is the Wheels on the axle-tree.

D. are the Rockets on the axle-tree.

28 *Of divers other rare Works, which are to be performed on the water.*

THose places which are situated upon Rivers or great Ponds, are proper to make these recreative Fires

Fires on; therefore if you desire to make some of consequence, they ought to be built upon Boats, or light timber, which may be framed like Beasts, or Fishes spitting of fire; upon which may be built Castles, Pageants, Turrets, or other conceits as you please. As if you would present a Castle, out of which shall issue a Dragon, which shall swim through the water, and that Dragon be encountred by a horseman, which is thus performed. Cause a Castle to be framed (as is shewed) on light timber, and let the bottom of the door of the Castle with a ground plat be two foot under the brim of the water, (the reasons follow) and at a foot high within the Castle let there be a certain line tyed which may pass through the body of the Dragon, and may be fastened near the shoar, where must be a float sunk so far under water, that the line may not be perceived; then fasten on your Dragon (as was shewed before for the line) but so that the head of this may alwayes be above the line, whereas the other was under, then at the appointed time, there must be one ready within the Castle, to fire those parts of the Dragon which is requisite; which being done (by the help of the pulleys) shall pass it through the water, which so soon as it presents it self, *Neptune* on a Sea-horse shall come, and encounter the said Dragon, and at last shall overcome it: Or you may order the work so that which you please shall have the victory; for that which keepeth fire longest, is supposed to have the best and that which is sooneſt spent, to have the worst.

G. representeth the Castle floating on the water, from whence issueth the Dragon.

E. is

E. is the Dragon coming forth of the Caſtle.

D. is *Neptune* riding on the Sea-horſe, coming to encounter the Dragon.

F. is the Pully that cauſeth theſe motions by the Line, to be pulled to and fro.

You may if you pleaſe, build upon Boats, or Timber, Turrets, Pageants, or Caſtles, as is ſaid, to receive or hold diverſity of Fire-works that may be made within them, which may play out, and play divers Fires, as Reports, Stars, Golden Rain, Fiſgigs, Granadoes, and Balls of Fire to burn in the water, which will give great content to the eyes of the beholders; and in the concluſion, it may be ſo ordered, that they may fire one another, for which end they were made.

29 *The manner to compose a Ship of Fire-works, which being once fired, divers motions will present themselves.*

YOu must make a mould or body of a Ship to be made, that you may take off the upper deck, to place some works underneath, where you must have a fire-wheel placed with a screw on the Axle-tree; this Wheel must be placed in the stern, and must turn a rouler, on which must be two girts placed, that must pass on each side of the main mast, and run on to the foreship; in this Wheel there must be a hollow spoke and axle-tree, as I have shewed, which must be so ordered, that the Wheel being spent, it may convey fire to a tire of Guns, lying round about, which must be fired with a close conveyance; and having passed that, it must take hold of another conveyance which shall give fire to certain Rockets, which must be placed in the body of some figures representing mariners, and must be so fitted, that they may have a Cane joyned to their body to guide them, that they may run on the ropes from the Deck to the top of the masts. This and other the like may be performed with great facility; the form of which followeth.

B. The Fire-wheel which moveth the Rouler, and carrieth the girt whereon the Figures are placed.

C. The Figures placed on the girt being in motion.

E E. The Figures which stand ready to run up the cords, some half way, some at top.

30 *Of*

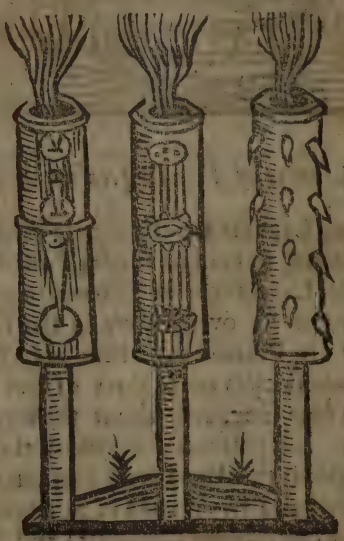
30 *Of Launces of Fire for pleasure and for service.*

STanding Launces are commonly made with hollow wood, to contain sundry Petards or Rockets; these Lances may be fastened to posts, so that they may not be overthrown in the flying out of the Rockets or Petards: but there are a lesser sort of Launces, whose cases are of three or four foldings of paper of a foot long, and about the bigness of ones finger: the composition wherewith these Launces must be filled is this; Unto every four ounces of powder you must add two ounces of Salt-peter, and unto that add one ounce of Sulphur; and then it will make a brick fire red colour before it be half spent, if

the

the Launce be fired and held to it : Now if twenty ſuch Launces were placed about a great Rocket, and ſhot to a houſe or ſhip, it would produce a miſchievous effect.

Or, if unto the end of the Rocket there were faſtened an arrow (which muſt not be too heavy) and inſtead of the feathers, it ſhould be of thin white tin plate, and if you give fire to it being thus prepared, you may ſee how ſerviceable it will prove. To the head of ſuch Rockets may be placed Petards, balls of Fire, Granadoes, and the like, and ſo may be applyed to warlike affairs.



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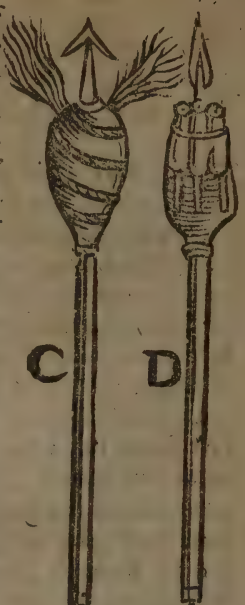
How to arm a Dart or Javelin with Wild-fire, for the Sayls or sides of Ships.

YOu may arm a Dart, Javelin, Partizan, or such like weapon to do excellent service, being in the hand of a valiant Souldier, as you may see by the Letter C. in the same: The same should be filled with the self like Receipt, as before is shewed for the Pikes with Wild-fire, which will be a very good weapon for to go into the sides or sails of Ships.

Or you may place upon the staffe of your Javelin certain Pistol barrels of one length, about ten or twelve inches, letting the same into the wood round about the staffe a little, as a Pistol barrel is into the stock (as the Figure marked with the letter D. sheweth) which staffe should have so much substance at the one end, whereto you may nail the same barrels fast at the breech; and about the midst of the same put over a hoop of Iron, as close as ever you can, the which is to be charged in this manner following, *viz.* First charge every barrel with two inches of powder, after put in a bullet a little lower than the bore of the same piece; then take of this slow Receipt following.

Of bruised Powder four parts, of Salt-peter in meal, Linseed Oyl, Brimstone finely beaten, Varnish, and of Willow or hazel cole moistned with a little Vinegar: (of all these five last Ingredients one Part;)which must be well wrought together with the hand in some wooden Vessel, till you feel that

it will cling together, of which you must put in after the bullet two inches, and thrust the same together with a Rammer stick; and then again put in two inches of Powder, and after that a bullet; and lastly, two inches of this slow Receipt, untill you have filled every one of the said barrels within half an inch of the mouth, the which is to be filled up with the said slow Receipt, and powder bruised and mixed together, that it may the sooner fire: This being done, bind a paper over the mouths of the same, untill you will use them; and giving fire to any one of the same, it will fire all the other, and every one will discharge three or four shots apiece one after another, to the hurt of the enemy, being used in service either to offend or defend; to the pleasure of the beholders, being used in triumph with bullets of Receipt rolled in tow, and coated with brimstone.



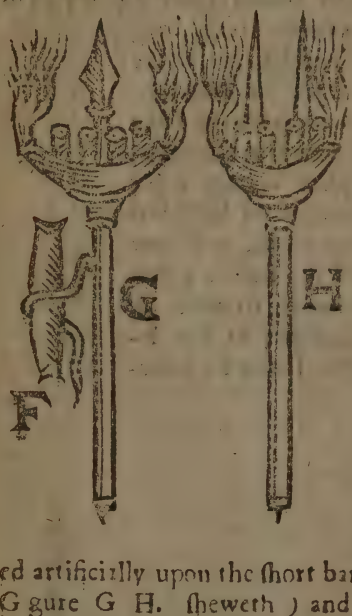
How to enter up a pair of ſtairs, or to defend ones ſelf, being in a narrow Room.

IF you are ſtreightned up in a narrow Room, to defend your ſelf, or would enter up a pair of ſtairs, where you cannot uſe a long weapon, you may make a Logget, whoſe ſtaffe ſhall be but three or four foot long, arming the ſame with the ſame Receipt as was ſhewed to arm the pikes, whereon you may place certain pipes of Braſs or Iron, charged as before is taught; And if you pleaſe, you may put into the end of the ſtaffe, a Rapier blade with a skrew, to take off and on at your pleaſure, as the Figure marked with the Letter E. ſheweth

How to defend a Breach, in a Ship or other place of defence.

TO perform this, you may arm a Partezan Javelin, or Fork with Firework, and to ſhoot

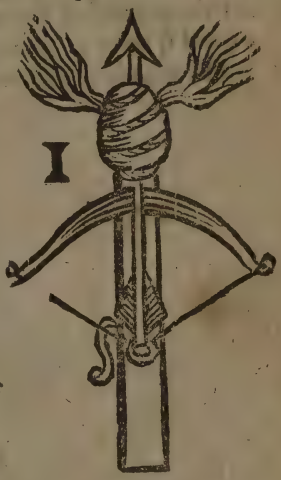
every one of them with ſeven or eight piſtol o musket bullets in nailing a plate of Iron croſs the pike or point of the ſaid Javelin, or between the grains of the fork, piercing certain holes through the ſame, unto which with a ſtrong wyer, you may make faſt on either ſide ſo many pipes of Iron, of



ſeven or eight inches long, as you think convenient to fix upon either or any of the ſaid weapons, and charging the ſame with powder, bullet and wad, you may cauſe the ſame to fire one after another, in filling a roule of Canvas ſewed together, (as the figure F. ſheweth,) with ſlow Receipt, and coated, as before is ſhewed: And this being placed artificially upon the ſhort barrels or pipes (as the Figure G H. ſheweth) and primed with fine powder directly againſt the Touch holes of the barrels, paſting a little paper over the ſame, firing the ſaid trains at both the ends, which as they burn, ſhall ſtill diſcharge the ſhort pieces one after another, to the great hurt of the Adverſary.

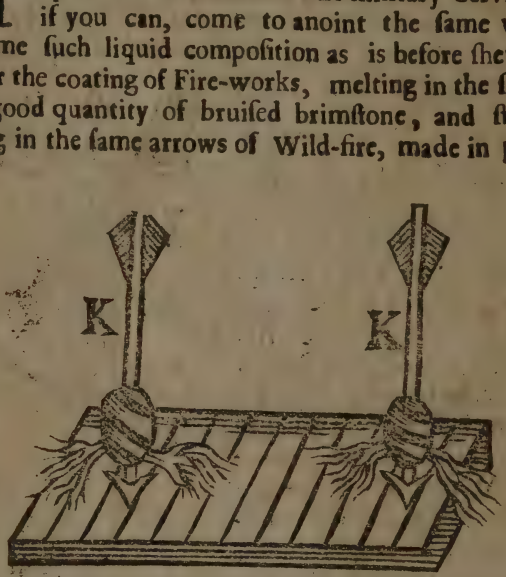
How to shoot Arrows of Wild-fire out of a Cross-bow.

THis is an excellent way to fire the Sails of Ships, thatched Houses, Stacks of corn, or Hay, or any such combustible matter apt to burn, which may be done at a pretty distance off, when you cannot conveniently come near the same: Therefore it is good to have certain strong Cross-blows, to bend either with a Rack, or Gessel, and to shoot out of the same strong Arrows armed with Wild-Fire, and headed as the Figure I. sheweth: or you may shoot these Arrows out of a Musket if you please; The composition is to be made as is taught in the arming of pikes with Fire-works, which Arrows may do great good for divers other services.



How to burn Wooden Bridges, Gates, Houſes, &c,

TO perform this and the like military Services, if you can, come to anoint the ſame with ſome ſuch liquid compoſition as is before ſhewed for the coating of Fire-works, melting in the ſame a good quantity of bruiſed brimſtone, and ſticking in the ſame arrows of Wild-fire, made in pro-

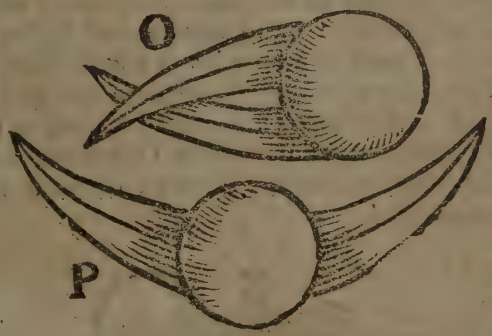


portion, as the Figure K doth ſhew. The Receipts may be made as the former for Pikes, with Wild-fire, which will certainly ſet the ſame on fire, for the Receipt is ſo forcible that it will burn in the water.

How

How to cut the Cables, or the Shrouds of Ships, at a good distance.

FOR Sea-service there is deviſed out of great Ordnance to ſhoot certain bullets that ſhall open and ſhut with a joynt in the head like a pair of Compaſſes, the arms or legs whereof are made in proportion like to the blade of a knife taper-wiſe, and bowing ſharp towards the point; as the Figure ſheweth marked with the Letter O, and how the ſame is to be put into the Piece after the powder

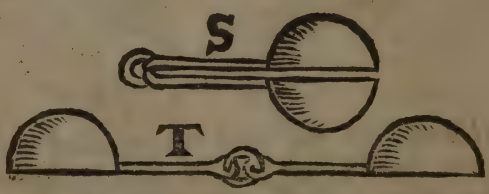


and Wad; and the other figure marked with the Letter P, doth ſhew how the ſame being in its violent motion, flyeth open through the Air like a Sithe, cutting the Cables, Shrowds, or any thing in its way, being ſhot out of any piece of great Ordnance.

Oſher

Other Devices for the cutting of Shrouds or the like.

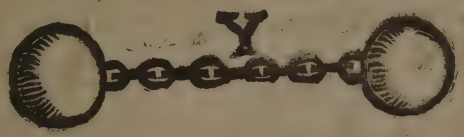
FOR to cut the Tackle or ſhrouds of ſhips, it is good to caſt half bullets of Iron, or lead, unto every of which make faſt a barr of Iron, wrought either three or four ſquare, about the bigneſs of a mans finger, and cut ſome fourteen or ſixteen inches long, with a loop at the end, unto which a Ring of Iron is to be put, that the ſame may cloſe and ſhut as the Figure with the letter S. ſheweth; which ſheweth alſo how you muſt put the ſame into the Piece; and the other figure with the letter T. doth ſhew how the ſame flyeth in its moving through the ayr: or to the ſaid half bullets you may have barrs in proportion of a knife blade, with a round joynt at the end to open and ſhut, the which kind of bullets may as well be made to ſhoot out of Muskets, as out of great Ordnance, to the great annoyance of the Enemy, eſpecially in Sea Service.



Another

Another for the same.

ALso to cut the Tackle of Ships, or to do many other good services, either with musket or great Ordnance, it is good to chain two bullets together as the Figure Y. sheweth.



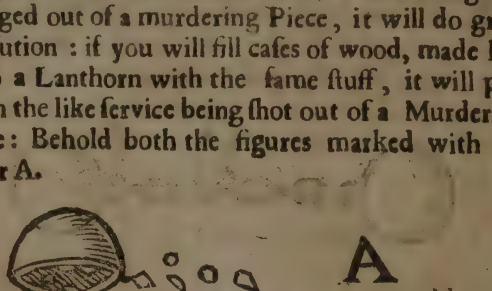
Another.

ALso for the like purpose aforesaid, if you take a small Iron Chain with good Links, rolling the same together round, that it may go easily into the Piece, close down to the wad, the same being again discharged, will spread it self in length and do good execution.

How to do excellent Service against an enemy who would enter a Breach, a Gate, a Bridge, a Ship, &c.

IF that the Enemy will enter (and that you intend not to yield) it is necessary to have in readines

dineſs divers hollow bullets made of two plates of iron, or other mettal, ſo that the one may cloſe about the other round like a box, which being filled with pebble ſtones, ſquare pieces of iron, called Dice-ſhot, musket bullets or the like, which being diſcharged out of a murdering Piece, it will do great execution: if you will fill caſes of wood, made like unto a Lanthorn with the ſame ſtuff, it will perform the like ſervice being ſhot out of a Murdering piece: Behold both the figures marked with the letter A.



How to prevent a train of Powder laid to blow you up before you enter a Ship, or other place.

IF you imagine that there is ſome train laid to blow you up (as it often happeneth) you may prevent the ſame, by waſhing certain Purſes of Canvas, filled half full of good corn-powder, and with eight or ten fiery bullets of an inch, or an inch and half

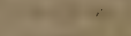
half in height; and filling the other part of the Purſe with ſlow Receipt, you may when you think good (the Receipt being well fired) throw the ſame from you, which will burſt in pieces after the lighting on the ground, and diſperſe the ſaid incloſed bullets here and there, which bullets will burn furiouſly, and if there be any train of powder laid near, it will preſently fire the ſame. The ſaid purſes are very good to throw out of hand, or may be ſhot out of a Morter-piece amongſt men in battle-array, to diſorder them, or into a Town; the Figure B ſheweth how to fill the purſes, and the Letter C. ſheweth the proportion of it, being made up, filled and coated over.

The receipt for making theſe bullets of Wilde-fire following: Take of Sulphur in meal ſix parts, of Roſin in meal three parts, melting the ſame in ſome pot or pan over a ſlow fire; then take of Stone-pitch one part, of hard Wax one pound, of Tar one fourth part, of Aqua-vitæ one half-part, of Linſeed-oyl as much, of Verdegreaſe one fourth part, and of Camphir one eighth part, melting all theſe together likewiſe, and ſtir into the ſame two parts of Peter in meal; and taking the ſame from the fire put therein four parts of bruiſed powder, working the ſame well together in your hands, and roul the ſame round of the bigneſs that you would have your balls of, boring two holes through the ſame a-croſs, which when you would uſe, muſt be primed full of bruiſed Powder; theſe balls will be as hard as ſtone, and needeth no coating, and being fired will burn furiouſly, and cleave to any

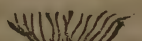
thing

thing, not diminiſhing in quantity being burned to aſhes, which aſhes will kindle an Oaken board: If you pleaſe, you may ſhoot theſe bullets out of a Piece of great Ordnance. The Figures for the Purſes here follow.

B



C



Short

Short, but certain Rules for the making all sorts of Fire-works for recreation, as Rockets, Fisgigs, Runners on the Line, Serpents, Stars, Fire-wheels, Clubs, Jack in a Box, *&c.* Together with the quantity of all the ingredients thereunto belonging, and the manner of compounding them.

How to compose a Castle of Fire-works with small charge, that in the firing will yield as much variety, and give as much content as any: Now published for the benefit of young Practitioners. By W. R.

IN all things actual, a certain method is requisite to be observed. Therefore, such as intend to put in Practice these ensuing Instructions, are first to provide themselves of such Rocket Moulds as are suitable to the work they undertake. The description and proportion of them, I conceive somewhat needless, in regard any one may in Crooked Lane, *London*, be furnished with what sizes they please. This being premised, I shall begin with

Fisgigs, by many called Serpents.

THE best way of making them is thus: having provided a small mould without a Needle, make

make a Coffin of paper fit for it, which choak half an inch from the end; then put it in your mould, and fill up three inches with powder-duſt only, finely beaten and ſifted, then choak it again, and afterwards fill it about an inch with corn powder; then choak it cloſe, and your Fiſgig is prepared. To uſe theſe on the tops of great Rockets, put into the mouths of them ſome of the Compoſition for Stars, which will ſhew very delectable to the ſpectators; for after they have continued a good ſpace in the form and manner of Stars, they will then riggle to and fro, like ſo many flying Serpents: Of theſe Fiſgigs moſt ſorts of Fire-works are compoſed. When you can perfectly make theſe, you may then proceed to the making

Runners on a line.

AND for them is likewiſe requiſite a Mould, five inches long without a Needle: firſt make your Coffin of paper, choak it at the end as before, then put it in your mould, and fill it four inches with Powder-duſt: (Note that in the filling it you muſt put in but a little at a time, and ramm it down cloſe and ſo of all others.) Then choak it, and fill the reſt of it with corn Powder (to give a report) leaving only ſo much of the Coffin void as will ſerve to choak it. This being done tye it to a hollow Cane three inches long; ſo as in tying of it you do not bruiſe the Rocket. And ſo have you a ſingle Runner for the Line finiſhed.

If you deſire to have a double one to run forwards, and back again, you muſt then be provided of two Run-

Runners made after the manner of the former, only one to be an inch longer than the other: And to finish these, use this method. First tye the long Rocket to the Cane, and at the mouth of it fasten the breech of the short one, by rouling over them a little piece of paper, with some powder-dust in it to give fire to the long one, not forgetting to make a small hole in the breech of the short one with a bodkin, that so the long one may take fire: having done so, then turn back the short Rocket so, that the mouth of it may reach somewhat further than the breech of the long one; left in firing it you accidentally fire both, and by that means spoil your Runners; The best way of tyeing the double ones is to fasten the short one so, as the long one may be betwixt it and the Cane; for by that means it will run without swagging; whereas, if they be both joyned to the Cane, as Mr. *Bates* and some others direct, it is both unsafe, and uncertain; unsafe in this, in case the first accidentally break, the other with the force of it will be struck off; and uncertain it is likewise, in regard after the first Rocket is spent, the Coffin of it coming back will swag and retard the passage of the other, and by that means indanger burning of the Line. Let your Line be well rubbed with soap; which will both secure it from fire and facilitate the passage of the runner: likewise for these and all other, let your Powder-dust be beaten, and sifted very small, for the least corns in it may danger the breaking.

How to compose a Wheel.

First provide a Wheel, either round or square, the better sort are 8 square, made fit to the length of the Rocket, five inches each, the best proportion is about sixteen inches diameter. Now having provided a Wheel, take so many Rockets, made after the same manner as those are which run on the line, which you must fasten together, by joyning the mouth of the one to the breech of the other, in the same manner as those for the line; in the tying them on, have a care you do not bruise them, and be sure to leave some space betwixt the mouth of the first, and the breech of the last, that so by firing the first the last may not take, and by that means breed a confusion.

You may order these Wheels to burn either Horizontal or Vertical: for the Horizontal provide a post or staff, with a pin on the top of it to put the wheel on; if vertical, then provide a pin fastened to the side.

How to make a Club to cast forth divers Fisgigs.

TO do this, first cause a piece of wood to be turned four inches diameter, let it be bored with an Augur of an inch and half bore from the top towards the bottom, leaving the bottom somewhat above an inch thick, and a place underneath to fasten a staff in; the length of it may be about eighteen inches: then draw a line spiral wayes about it from the bottom to the top in manner of a screw, each line

line an inch and half asunder, in that line bore small holes an inch asunder within half an inch of the bottom, and then pierce it through with a Piercer; let your holes be of that bigness fit to contain a Fisgig, and make them somewhat slope-ways, that so the Fisgigs may stand fast, though slack, otherwise they will not come easily forth.

Load your Club or Trunk with the composition following, and then put in your Fisgig made as before, priming each of them, and likewise each hole with powder-dust, then fire your Club at the top, and they will fire one after another, and fly about in a confused manner.

The Composition for this Club is.

Roch Peter eight ounces, Sulphur vivum four ounces, powder dust two ounces, Camphire one ounce, Linseed oyl half an ounce; beat and mix these according to the order prescribed in the compositions following.

To make Rockets for the Air.

PRovide first a good mould of what size you please, with a Needle in it, and a Rowler with two Rammers, the one hollow for the Needle and the other sad, to ram it after the Needle is covered. Having made a good strong Coffin of paper fit for the mould, and choaked as before, then fill it with the composition for that size your Rocket is of, the several proportions and mixtures hereafter follow. To fill it, take a little tin scope, and put in about the twentieth part of the quantity it holds, and then ram it with your hollow ram-

mer, and so continue till you have filled it to the top of the Needle, alwayes beating it down with two or three good strokes of a maller, then fill in more almost to the top of the Mould, ramming it as before, but with your sad rammer, leaving only so much unfilled as that you may double down some of the paper and ram it close, making a little hole with a bodkin to give fire to some corn powder (to give a report) put within that Paper as is left unfolded down, and then choak it, next prime it, as shall be shewn hereafter, and then proceed to heading of it, which you may do several wayes, either with Stars, Serpents, Crackers, or golden Rain: the composition for the making these hereafter follows. To place these on the Rocket, first make a thin Coffin of paper, the inside of it somewhat wider than the outside of the Rocket, which you may fit by rouling it on the outside of the mould, and fitting it to the Rocket, then fasten it to the top of the Rocket, and strew a little powder in it, having first made a small hole in the top of the Rocket to give fire to it: in this Coffin you may place short Serpents with the mouths downward made as before, or with Stars only, Crackers or golden Rain; having done this, take a piece of thin pasteboard, and with a pair of Compasses make a round circle in it, then divide it in two, and with the one half make a cap taper-wise, fit to cover the head, and with glew fasten it to it: then provide a dry Osier stick about eight times the length of the Rocket, straight and flatted at the end, to this fasten the Roket, tyed at both ends just in the choaking place, that so you may not loosen the

com-

compoſition within, then poiſe the ſtick, by ballancing it on your finger three or four inches from the mouth of the Rocket.

The Ingredients for Rockets for the Air of all ſizes.

FOr Rockets which contain from one ounce to four, to one pound of powder-duſt, put two ounces of Charcole duſt: for Rockets which hold from five ounces to ten, to one pound of powder, put two ounces and a half of charcoal duſt: and for Rockets which hold from ten to ſixteen ounces, to one pound of powder put three ounces of charcoal duſt; but be ſure that both your powder-duſt in this and all other be well beaten, and finely ſifted, as likewiſe your coal duſt. If by trying your compoſition you find it too ſtrong, you may mend it by adding a ſmall quantity of coal duſt to it: if too weak, then by adding a little powder-duſt. My advice is, to mix a pretty quantity together, that ſo by the tryal of one Rocket you may be aſcertained of the reſt: for all powder is not of one and the ſame ſtrength.

Priming for Rockets.

TAke Cotten wick (ſuch as the Chandlers uſe) and ſoak it in oyl of Camphire, then take it out and roul it in powder-duſt, then dry it, and keep it cloſe, otherwiſe the ſtrength of the camphire will decay. The compoſition for Stars will likewiſe fire them.

Compoſition for Stars, and firſt for thoſe of a blew and red colour.

POwder mealed fine four ounces, Salt-peter two ounces, Sulphur vivum ſix ounces, beat theſe very fine, and then mix them, adding thereto one ounce of Aqua-vitæ, and a quarter of an ounce of oyl of Spike. To make theſe up for uſe, Take a rouler about the bigneſs of an arrow, and roul paper on it, and paſte it cloſe, then fill it with the compoſition before preſcribed, and beat it hard, then cut it into ſhort pieces half an inch in length, dipping one end in glew, and ſtrewing the other with powder-duſt, it is then finiſhed, only let it be dry before you uſe it.

A Compoſition of Stars of a very beautiful colour, the eaſieſt, beſt and ſureſt way, never till now made publick by any.

SAlt-peter one ounce Sulphur vivum one ounce, powder-duſt one ounce, Camphire a quarter of an ounce, beat theſe very fine and mix them, afterwards make paſte of them with the oyl of Turpentine, and then make up little pieces about the bigneſs of a Peaſe, which roul in powder-duſt, and let it dry. Of this ſort you may put two or three dozen at the head of an ordinary Rocket, the charge and trouble of making is far leſs than any other way.

To make golden Rain.

PRovide your ſelf of a good quantity of Gooſe Quils, cut them off at the end next the feathers, then

then fill the quills with the following compoſition, and they will make a very glorious ſhew. To one quarter of a pound of powder-duſt add half an ounce of coal duſt, and for uſe put the open end of the quill downwards.

To make a Jack in a Box.

PRovide a tin box ſix inches deep, with a ſocke made under the bottom of it to place it on a ſtaff, let it be of what bigneſs you pleaſe, in the bottom of it ſtrew ſome corn powder almoſt half an inch thick, then fill it with Serpents, or Fiſgigs placed with the mouths downward, leaving a place in the midſt for a cane to paſs through, which fill with a ſlow compoſition; (that for Stars, or theſe following are very good) then put in the cane, and faſten a cover of paſtboard very cloſe over the box, that ſo it may not fire before its appointed time.

A compoſition that burns with a flame ſlow and ſure.

ROch peter four ounces, Sulphur vivum two ounces, Camphire one quarter of an ounce, powder-duſt one ounce. Meal theſe very fine and mix them, adding thereto one quarter of an ounce of Linſeed oyl, and a quarter of an ounce of oyl of peter dropped in by degrees, and ſo wrought to a paſte. To meal your Camphire, dip the peſtle in oyl of Almonds.

Another ſort of mixture that burns ſparkling.

POwder-duſt four ounces, Coal-duſt two ounces; this rammed cloſe in a Cane, renders the ſight very delectable to the ſpectators.

A composition for a white fire, that lasteth long.

SAlt-peter eight ounces, Powder-dust two ounces, *Sulphur vivum* four ounces, Oyl of Peter one ounce, Camphire half an ounce; meal those which are to be mealed, and incorporate them together.

How to compose a Castle of Fire-works with small charge, that in the firing shall yield as much variety, and give as much content as any.

FIrst provide an indifferent large frame of wood, four square, with little round Towers of Past-board at the Corners, the best size is 18 inches square, and twelve inches high, let the bottom be made firm to stand on any place, and the sides with gates, (as your fancy shall direct) then fasten on the inside three ledges of wood on each side about, each ledge with a groof made on the the top of it, then make so many holes in the frame of wood suitable to the ledges, as you intend to have the Castle give reports: you may easily make eight to each ledge, which contains 96 reports, you may add more as you see cause; or at the top fasten many Crackers, which at the end will fire like a volley of shot: the manner of making these reports shall be shewed hereafter; and to place them, first prime your groof with a slow composition, and from the uppermost Row to the second put a wick, primed, as for Rockets, and so from the second Row

to

to the third, leaving some hanging forth at the door to fire it, then put in your Reports the mouths inward, fix them to your grooss and cover it close, afterward fit a board four square to cover the top of the Castle, of each side half an inch broader than the Castle: on the four edges of it you may fasten Pastboard cut stone-work wayes in manner of a battlement, and at each corner, place a small jack in a box with a long Cane in each of them, filled with slow composition, made as before; which Canes let be of the largness as may burn all the time the Castle is firing: in the midst of the board on the top, place a pin to put a wheel on, made of thin Deal board, five, six or eight inches square, proportionable to the length of the Rockets, which fasten to the board by making holes in it, to tye them to it: on the top of this Wheel you may fasten little statues of Babies, as Souldiers, Drummers, or the like: and as the Wheel turns, they will move about like Anticks, with much delight to the spectators: And so have you finished your Castle. To fire it, first Fire the four Canes in the four Boxes at the corners, then fire the Wheel at the top, and lastly, fire the cotten wick at the Gate, and so the reports will by degrees fire upwards, and in the end conclude with a volley of shot. If it be exactly made, it will continue a long space with abundance of delight.

How to make Reports for a Castle.

First make a Coffin of paper choaked as before, of what size you please, then fill it about an inch

inch and a half with corn powder, ramming it close; and at the end ram in a piece of paper as you do to a musket, leaving the mouth open, and then it is finished: When you use them, prime the mouth of it but a little.

How to make Rockets for the Ground.

First, provide a Rocket (ready finished) as for the fire, then put the breech of it into a bladder, blow the bladder up, and then fasten it at the choaking place, by tying it close: when you fire it, throw it from you, and the force of it when it comes to the ground will make it rebound, and so be in a continual agitation.

An almanack whereby to find the dayes of the Month this present year (1653) Which with the transposition of the moneths yearly, will serve for ever. Note, that the year begins at March.

6 *August*	3 *May*	11 *Jannary* 8 *October*	2 *April* 5 *July*	7 *September* 10 *December*	4 *June*	12 *February* 1 *March* 9 *November*
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Thirty dayes hath *September*,
April, *June* and *November*.
February hath eight and twenty alone,
All the reſt have thirty and one.

An explanation of the foregoing Table.

Note that where the months end, you muſt then begin at the firſt figure of the Table, and that every leap year *February* hath 29 dayes.

To find the day of the month by the foregoing Table.

OBſerve that the Mondayes that happen in each Month, will fall upon thoſe dayes of the Month that are expreſſed in the ſame Column underneath it. As for inſtance, the Mondayes in *Auguſt* are on the 1,8,15,22,29. dayes of it; thoſe in *September* and *December* are on the 5, 12, 19, 26. dayes, and ſo of the reſt. Now by this to find the day of the month you deſire, firſt find the Month, and under it that Monday of the month laſt paſt, and then you may eaſily know it: As for example, if you deſire to know what day of the month the firſt Sunday in *May* will be: Firſt find *May*, under it you will ſee a Figure of 2, being the firſt Monday, then reckon Tueſday 3, Wedneſday 4, Thurſday 5, Fryday 6, and Saturday 7. and ſo of the reſt. Again, if you would know what day of the week the 18 of *November* will be, look under *November*, and you ſhall find the Monday next before it to be the 14, then reckon Tueſday 15, Wedneſday 16, Thurſday 17, and Friday 18. and ſo of the reſt.

FINIS.

Necessary Directions for *Drawing* and *Painting*.

How to take the perfect draught of any printed, or painted Picture.

TAKE a sheet of *Venice* paper, or else of the finest white paper that you can get: wet it all over with clean Sallet-oyl, then wipe the oyl off from the paper as clean as you can, so that the paper may be dry, otherwise it will spoil a painted picture by the soaking through of the oyl. Having thus prepared your paper, lay it upon any painted or printed picture, and you shall see the picture through the same more perfectly appearing than through glass, and so with a black Lead Pen, you may draw it over with ease and better, first with a soft Charcoal, and then with a pen. After that you have thus drawn the picture upon the oyled paper, put it upon a sheet of clean white Paper, and with a little stick pointed, or (which is better) with a feather taken out of a Swallowes wing, draw over the Picture again, and so you shall have the same very prettily and neatly drawn upon the white paper, which you may set out with Colours, as shall be taught hereafter.

Ano-

Another way.

Having drawn the picture, (first open the oyled paper) put it upon a sheet of clean white paper, and prick over the same drawing with a good big pin, then from the clean sheet that is pricked, pounce it upon another; that is take some small cool, powder it fine, and wrap it in a piece of Tiffany or such like, and bind it up therein loosely, and clap it lightly over all the pricked lines by little and little, and afterwards draw it over again with a pen or pencil, or otherwise as you please.

Another way.

Take a sheet of thin white paper, and rub it all over one side with black Lead, or else with Vermilion tempered with a little fresh Butter; then lay the coloured side upon a sheet of clean paper; then lay the Picture you would copy out, upon the other side of the coloured paper, and with a small pointed stick, or with a Swallow's feather, go over all the stroks of your picture that you desire, and then you shall have all the strokes drawn very prettily on your white paper.

Another way.

Take a piece of clear Lantern-horn, and lay it upon your picture; then with a pen made of a Ravens quill, draw the strokes of your picture upon the horn, and when it is dry, breath upon the horn twice or thrice, and press it hard upon a piece of

clean

clean white paper a little wetted, and the Picture that you drew upon the horn will cleave faſt upon the paper.

Another way.

Take a ſheet of white paper, rub it all over with freſh butter, and dry it by the fire, then rub one ſide of it all over with Lamper black-lake, or any other colour finely ground, lay this paper upon a ſheet of clean paper with the coloured ſide downwards, and upon it lay the picture you would copy out, and trace the ſtrokes over with a feather of a Swallow's wings, and you ſhall have your deſire.

Another way very pretty and eaſie to be performed.

Take ſome Lake and grind it fine, then temper it with Linſeed oyl, and afterwards with a pen draw with this mixture (inſtead of ink) all the out-ſtrokes of any printed picture, alſo the muſcles, then wet the contrary ſide of the picture, and preſs it hard upon a ſheet of clean paper, and it will leave behind it all the ſtrokes of the ſaid picture that you drew over.

Another way much like the former.

Take Printers blacking, grind it fine, and temper it with fair water, and with a pen dipt therein, draw over the maſter ſtrokes and out-lines of the Muſcles; wet then a fair paper with a ſponge, and clap the picture upon it, preſſing it very hard thereupon, and you ſhall find the ſtrokes you drew, left upon the fair paper.

Of

Of *Painting.*

Of washing Maps, and other printed Pictures.

WAshing Pictures is nothing else but the setting of them out with Water-colours, and for the effecting hereof you must be provided with store of Pencils, some smaller than other, also with Allum-water, Lime-water, Gum-water, water made of Sope-ashes, Size, Varnish, and store of good Colours well prepared.

How to make Allum-water.

TAke a Quart of Water and boil it with a quarter of a pound of Allum, seeth it untill it be molten, and let it then stand a day; with this water you must wet over your pictures that you intend to colour, for it will keep the Colours from sinking into the Paper, also it will add a lustre unto the Colours, that is, make them to shew fairer, and it will also make them continue longer without fading; some Paper will need to be wetted four or five times. You must let the Paper dry of it self after you have once wetted it, before you either lye on your Colours, or before you wet it again, if so be it need a second or more wettings.

How

How to make Gum water.

TAke clean water, and put into it of Gum Arabick a little, and let it ſtand untill the Gum be diſſolved. Now you muſt have a care that it be neither too thick by reaſon of the Gum, nor yet too thin: for with the one you cannot work well, and the other will not bind faſt enough; with this water you muſt temper your Colours before you lay them on your Picture.

How to make Lime-water.

TAke unſlaked Lime and cover it with water an inch thick, and let it ſtand ſo one night, in the morning pour off the clear water, and reſerve it in a clean thing for your uſe; with this water you muſt temper your ſap-green, when you would have a blew colour of it.

How to make water of Sope-aſhes.

STeep *Sope* aſhes a night in Rain water, in the morning pour off the cleareſt: this water is to temper your Braſil with.

How to make Size.

TAke a quantity of Glew, and let it ſteep a night in water to make it the readier to melt in the morning; then ſet it on a coal of fire to melt, which done (to try whether it be neither too ſtiff, nor

nor too weak, for the meaneſt is beſt) take a ſpoonfull thereof, and ſet it in the air to cool, or fill a muſcle-ſhell with it, and let it ſwim in cold water to cool the ſooner: If it be two ſtiff when it is cold put more water unto it, if too weak then put more Glew unto it, and when you will occupy it, make it lukewarm, and ſo uſe it: this is to wet your cloaths in if you intend to paſte your Map or Pictures upon cloath.

How to prepare your Colours.

SUch as have need of grinding, you muſt firſt grinde them with fair water, and then put them upon ſmooth chalk-ſtone, and let them dry: then grinde them again with Gum-water, and reſerve them in muſcle-ſhells for your uſe.

Chooſe to lay on the thinneſt and moſt tranſparent colours, eſpecially if it be good work that you are to colour, ſo the one will ſet out the other; but if the work be none of the beſt, then endeavour to hide the imperfections thereof by laying your colours the thicker on it.

A Sea-colour.

Take Privet-berries when the Sun entreth into *Libra*, about the thirteenth of *September*, dry them in the Sun; then bruiſe them, and ſteep them in Allum-water, and ſtrain them into an earthen Porringer that is glazed: or you may uſe them before you dry them, for the drying of them is to make them keep long.

Another.

Take blew Inde and ſteep it in water, and put to it a little Verditet.

A yellow colour.

Take yellow berries and bruiſe them a little, and ſteep them a quarter of an hour in Allum-water, then ſtrain them if you will, or let them ſtand in the liquour, and work therewith.

A Ruſſet colour.

Take the fatteſt Soot you can get, and put it into a pot of clear water, ſo that it be covered two or three fingers and let it ſeeth well, which done, ſtrain it through, a cloath and ſet it on the fire again to thicken (but take heed you ſet it not on too hot a fire, for fear of burning it) ſo let it boil gently untill it be as thick as you would have it.

Colour for Faces.

Firſt, lay upon the cheeks little ſpots of Lake or red Lead, then come all over it with white, and a little Lake; ſhadow it with Lamp-black or Umber, and white Lead.

Hair Colour.

Take number of Spaniſh brown, grinde it and temper it with Gum-water.

Colours for naked Pictures.

Take white Lead and a little Vermilion, temper them and lay them on, ſhadow it with Bole-armoniack in the middle, and adde a little Soot to the utmoſt or double hatches.

A Colour for dead Corps.

Change white Lead with a little of the water of yellow

yellow berries, and waſh the picture all over, then change it with blew Inde, and ſhadow it with blew Inde, and ſhadow it in the ſingle hatches and leaneſt places: then take Soot, yellow berries and white Lead, and with that ſhadow the darkeſt places.

A blood-red colour.

Sinaper, Lake, and Vermilion make a good blood red: ſome have commended Mutton blood very highly, but I never tried it.

How to make Mutton blood-red.

Take ſome of the cleareſt blood of a Sheep, and put it in a bladder, and with a needle prick holes in the bottom of it, then hang it up to dry in the Sun; this ſaith a Painter (that told it me for a ſpeciall experiment) will make tranſparent and excellent blood-red colour, which you may alſo diſſolve in your Allum water, according as you have need thereof.

Colours for Garments.

A Purple Colour.

Take Logwood and ſeeth it in Vinegar and ſmall Beer in an earthen pot and put a little Allum therein untill you taſte it to be ſtrong on the tongue.

A red Colour.

Boil Braſil as you did the Logwood, and it will make a red colour: if you would have it a ſad red,

mingle it with pot-ash-water, if you would have it of a light red, temper it with white Lead.

A Crimson.

Sinaper tops, Sinaper lake, or Vermilion.

A green-colour.

Take Privet berry water, and change it with yellow berry water, and it giveth a perfect green, for the ground, and it is much used.

Another green.

Take Spanish green clean pickt and steeped in Rhenish wine, strain it and put it into a little Honey or white Sugar-candy, and it will make an excellent green.

For a light green.

Temper Verdigrease and white Lead, 2. Verdigrease, as much yellow berries, and a litte white.

Yellow-colour.

Orpiment and Saffron, Masticot, Gambougium; either of these give a very good yellow.

Blew Colours.

Verditer, Azure or Bice, blew Inde.

Colours for building.

Lay black and white Lead for the walls of Churches, Conduits, and greater buildings; Bolus for the pillars, and lesser houses; red Lead for Tiles; for the Leads blew and white; for Cottages Soot alone.

Colours

Colours for Landskip.

Lay Verditer, blew, white, and green; or firſt go all over it with Saffron, and white: then put a little Soot to them and go over it again.

Or firſt take green and white Lead, and go over it, ſhadow it with a little more green, then with white, and laſt of all with green, a little white, and yellow berries.

Sky-colour.

Braſil and white Lead is the lighteſt, then light purple and white, then Inde blew and white, the darkeſt of all is Inde blew.

Cloud-colours.

The lighteſt of all is white Lead and Inde blew, a like quantity of each: the next, a great deal of Inde and a little white; then purple and white with a little Braſil; then white Lead, and yellow berries.

Colours for the Sun-beams.

Lay yellow berreis with a little white, ſhadow it with Saffron and red Lead.

A Motley-green.

This colour is compounded of a red and green.

A Lincoln-green.

This colour is compounded of a good green and Saffron.

A Popinjay green.

This colour is compounded of Azure and Maſticot, or blew and yellow.

An excellent green.

Take Copper plates, put them into a pot, and put

some distilled Vinegar unto them, set them in a warm place untill the Vinegar become blew, then pour that liquor or coloured Vinegar into another Pot well leaded, and pour more Vinegar upon the Copper-plates again, letting that also stand untill it be of a blew colour; then pour it unto the former liquour, this you may do so often untill you have liquour enough, then let that liquour stand in the Sun untill it be thick enough.

A Lion-tauney.

This colour is made of red lead and masticot.

A Peach colour.

This colour is compounded of Cerus and Vermilion.

A Brass colour.

This is made of Masticot and Umber.

A marble or Ash colour.

This colour is made with black and white.

A Russet colour.

This colour is made with a little white, and a good quantity of red.

A brown blew.

It is made of two parts of Inde baudias, and a third of Cerus.

A Crane-colour.

It is onely made of red Lead ground with Gum-water.

To write Gold with the pen or pensil.

Take a shell of Gold and put a little Gum-water into it, and stir it about, and then you may work with it as with colours.

Thus by a little practising and tempering your colours one with another, you may with the same colours compound divers others that I have not mentioned, nay, almost what you list.

Ex-

Experiments perform'd by Legerdemain.

How to make it freeze by the fire side.

THis feat cannot be performed at every time, but only in winter, and at such times as snow may be had, and he that will shew it, must have in readiness an handfull of salt. The time serving, and the party provided, let him call for a joynt-stool, a quart-pot, and a handfull of snow, a little water, and a short staff or stick; first, let him pour a little water upon the stool, and upon it let him set the quart pot, and put the snow into the pot, the salt also but privately, then let him hold the pot fast with his left hand, and take the short stick in his right, and therewith churn the snow and salt in the pot, as if one should churn for butter, and in half a quarter of an hour the pot will freeze so hard to the stool, that you can scarcely with both hands pull it off from the stool: there is a natural reason may be given for this, which he that is a Scholar need not to be told, and for a common Jug-

ler I would not have so wise as to know, therefore I omit it.

How to make two Bells come into one hand, having put into each hand one.

THis feat must be performed with three Bells, you must put one Bell into your left sleeve, then put one bell into one hand, another bell into the other hand (they must be little Morris Bells) withdraw your hands, and privily convey the bell in your left hand into your right hand: Then stretch both your hands abroad, and bid two folks hold your hands fast, but first shake your hands, and say, do you hear them. The Bell that is in your sleeve will not be known by the ratling, but that it is in your hand: Then say, he now that is the arranteſt Whoremaster or Cuckold of you both shall have both the bells, and the other shall have none at all: open your hands then and shew them, and it will be thought that you deal by Art Magick.

How to make a Jugling Book, or Book of Waggery.

YOu must provide a Paper-book in Octavo, of what thickness you please; first turn over seven leaves of it, and then upon both the open sides, draw or paint the pictures of flowers then turn over seven leaves more and paint the very same; do this untill you have turned the book once quite over; Then unto the farther painted leaves, paste a little stay of paper or parchment one directly over another. Then turn over the book again, and having

ving turn'd every sixth leaf, draw the picture of flower-de-luces, and then paste stayes of parchment upon them as you did upon the first; but these stayes must all of them be a little lower than the former. Then turn over the the book again, and after the fifth leaf throughout the book is turned, paint horns: do thus untill you have painted the book full of pictures, onely let there be one part of the leaves fair paper; having thus finished the book, when you use it hold it in your left hand, and with your right hand, your thumb set upon the parchment stayes, shew them orderly and nimbly, but with a bold and audacious countenance, for that must be the grace of all your tricks: say, This book is not printed thus as some of you may suppose, but it is of such a property that whosoever bloweth on it, it will give the representation of whatsoever he is naturally addicted unto, and then turn the book, and say, see it's all fair paper.

Boxes to change Grain.

MAke one Box of Wood, Tinne, or Brass: let the bottom fall a quarter of an inch into the box, and glew thereon a laying of barley, or such like grain: draw the box with the bottom downwards, and say, Gentlemen, I met a Countrey-man going to buy barley, and I told him I would sell him a penyworth, also I would multiply one grain into so many bushels as he should need, then cast a barly-corn into your box, and cover it with a hat, and in the covering it, turn the bottom upside down: then cause some body to blow on the hat, then

then uncover it, and they will think ſtrangely of it. You may make another box of wood like unto a bell, to hold ſo much juſt as your former box will, and make a bottom unto this box of ſhooe-ſole leather, to thruſt into the bottom of the bell: then fill it with barley, and thruſt up the leather bottom, for it will keep the barley from falling out, take this box out of your pocket, and ſet it down gently upon the table, and ſay, I will not cauſe all the barley to go out of my meaſure into my bell, then with a hat cover the box that hath the barley glewed unto it, and in covering it, turn it with the barley downward, then ſay, firſt, let us ſee whether there be nothing under the bell, and clap it hard down upon the table, ſo the weight of the barley will thruſt the bottom down; then bid ſome one blow hard on the hat, then take it up, where they will ſee nothing but an empty meaſure, then take up the bell, and all the barley will pour out. Sweep it then preſently into your hat or lap, leſt their buſie prying may chance to diſcover your leather bottom.

A Conceit to procure laughter.

TAke a ball in one hand, and another in the other, and ſtretch your hands as far as you can one from the other, and if any will, lay a quart of wine with him that you will not withdraw your hands, and yet will make both of them come into either hand which they pleaſe: It is no more to do, than to lay one down upon the table, and turn your ſelf round, and take it up with the other hand, and your wager is won, and it will move no ſmall laughter to ſee a fool ſo loſe his money.

How

How to knit an hard knot upon an handkercher, and to seem to undo the same with words.

MAke one plain loose knot, with the two corner ends of a handkercher, with seeming to draw the same very hard, hold fast the body of the said handkercher (near to the knot) with your right hand pulling the contrary end with the left hand, which is the corner of that which you hold. Then close up handsomely the knot, which will be yet somewhat loose, and pull the handkercher so with your right hand, as the left hand end may be near to the knot: then will it seem to be a true and firm knot: and to make it appear more assuredly to be so indeed, let a stranger pull at the end which you hold in your left hand, while you hold fast the other in your right hand; and then holding the knot with your fore-finger and thumb, and the nether part of your handkercher with your other fingers, as you hold a bridle, when you would with one hand slip up the knot, and lengthen your rains. This done, turn your handkercher over the knot with the left hand, in doing whereof, you must suddenly slip out the end or corner, putting up the knot of your handkercher with your fore-finger and thumb, as you would put up the aforesaid knot over your bridle. Then deliver the same (covered and wrapt within the midst of your handkercher) to one to hold fast, and after the pronunciation of some words of art and wagers laid, take the handkercher and shake it and it will be loose.

How

How to transform any one small thing into another form by folding of paper.

TAke a sheet of paper and fold or double the same, so as one side be a little longer than the other: then put a Counter between the two leaves of the paper up to the middle of the top of the fold, holding the same so as it be not perceived, and lay a Groat on the outside there right against the Counter, and fold it down to the end of the longer side: and when you unfold it again, the Groat will be where the Counter was and the Counter where the Groat was, so as some will suppose that you have changed the money into a Counter, and with this many feats may be done.

How to convey Money out of one of your hands into the other by Legerdemain.

FIrst you must hold open your right hand, and lay therein a tester, or some big piece of money, then lay thereupon the top of your long left finger, and use some words of Art, and upon the sudden, slip your right hand from your finger, wherewith you held down the tester, and bending your hand a very little, you shall retain the tester still therein, and suddenly drawing your right hand thorow your left, you shall seem to have left the tester there, especially when you shut in due time your left hand. Which that it may more plainly appear to be truely done, you may take a knife, and seem to knock against, so as it shall make a great sound: but instead

ſtead of knocking the piece in the left hand (where none is) you ſhall hold the point of the knife faſt with the left hand, and knock againſt the teſter held in the other hand, and it will be thought to hit againſt the money in your left hand. Then after ſome words of Art pronounced, open your hand, and, when nothing is ſeen, it will be wondered at, how the teſter came removed.

How to make a Six-pence ſeem to fall through a Table.

You muſt have an handkercher about you, having a Counter neatly ſewed in one of the corners of it: take it out of your pocket, and deſire ſome body to lend you a teſter, and ſeem to wrap it up in the midſt of the handkercher, but retain it in your hand, and inſtead of ſo doing, wrap the corner in the midſt that hath the Counter ſewed in it and, then bid them feel if it be not there, which they will imagine to be no other than the teſter that they lent you, then bid them lay it under a hat upon the table, and call for a baſin of water, hold it under the table and knock, ſaying *vade*, come quick, and then let the ſix-pence fall out of your hand into the water. Then take up the hat, and take the handkercher and ſhake it ſaying, that is gone, then ſhew them the money in the baſin of water.

How to ſeem to blow a ſix-pence out of another mans hand.

Take a ſix-pence, blow on it, and clap it preſently into one of your ſpectators hands, bidding them

them to hold it fast : Then ask of him if he be sure to have it, then to be certain, he will open his hand and look. Then say to him, Nay but if you let my breath go off, I cannot do it. Then take it out of his hand again, and blow on it, and staring him in the face, clap a piece of horn in his hand, and retain the six pence, shutting his hand your self. Bid him hold his hand down, and slip the tester between one of his cuffs. Then take the stone that you shew feats with, and hold it unto his hand, saying, *By vertue here of, I will and command the Money to vanish you hold in your hand, Vade*, now see: when they have looked, then they will think that it is changed by the vertue of your stone. Then take the horn again and seem to cast it from you retaining it, and say, *Vade*, and anon say you have your money again : He then will begin to marvel, and say, I have not: say then to him again, you have, and I am sure you have it : Is't not in your hand? If it be not there; turn down one of your sleeves, for it is in one I am sure, where he findeth it, he will not a little wonder.

How to cast a piece of Money away, and to find it in another mans mouth, pocket, or purse.

THe Jugler calls for some one piece of Coin, as a tester or a shilling of any one in the company, he willeth him to mark it with what mark he will, then he taketh it, and casteth it away, and cometh to his confederate (who is furnished beforehand with the like piece of Coin, marked with the very same mark)and bids him deliver the money

ney out of his pocket, purſe, or if he ſay the word mouth; for this is concluded of before-hand. Now this confederate, to make the matter ſeem more ſtrange, will fume and fret, asking how he ſhould come by it, till having found the mark, he will confeſs it to be none of his, wondring at his skill, how he ſhould ſend it thither: and all the reſt be taken with a real admiration of his extraordinary cunning.

How by the ſound of a Counter phillipped to tell what ſide is uppermoſt, whether croſſe or pile.

THe Jugler draws a Counter out of his pocket, and ſaith to the company, See here is a Counter, take it who pleaſe, and let him phillip it up, and I will by my cunning tell you whether croſs or pile be uppermoſt by the very ſound, for you ſhall hoodwink me. Now there are three, or four, or more confederates in the place, who ſeeming ſtrangers as well as the reſt, will be very importunate to have the phillipping it, and before one of theſe ſhall have it, who by ſome ſign of the fingers or countenance (foreknown to the Juggler) do give him information after he is demanded. Of the ſame nature is that trick formerly mentioned in the book, and called, The decollation of *John Baptiſt*.

To make one dance naked is a trick of the ſame nature, for the party afore-hand is agreed to do it, and alſo the manner and circumſtances: So that the Jugler to blind the people, pronounceth ſundry words to ſuch a perſon, he then begins to rave like a mad man, and puts his cloaths off with a kind of violent

violent carelesness, though God knows, the party knows as well what he doth, as your self that reads it.

After the same manner shall you know what money another hath in his purse, and casting money into a pond, and finding it under a stone or threshold in another place.

Also to make a piece of money to leap out of a cup and run to another, by means of a small hair fastened to the money, which hair the Confederate guideth, with a multitude of such like strange feats, which may seem impossible to the judgement of the common people to be effected without the assistance of the Devil, or some familiar, which to nominate is neither needfull, nor will my occasions permit so much leisure as to do it.

Experiments in Arithmetick.

I.

To finde what number of Men are contained in a square Battail.

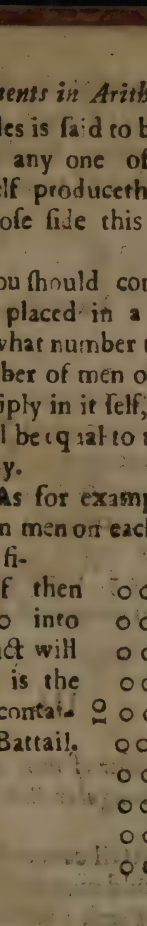
A Square in Geometry is called, A right lined plain figure, consisting of four equal sides, and so many right and equal angles, every

every of which sides is said to be the Square of the said figure ; and any one of these sides being multiplied in it self produceth a Square equal to the Square of whose side this multiplication was made.

Wherefore if you should come in place where a body of men were placed in a Square body, you may readily tell what number there is of them, by counting the number of men on any one side, and that number multiply in it self, the product of that multiplication shall be equal to the number of men in that whole body.

As for example.

If there were ten men on each side of the Square Battail (as in this figure there is) If then you multiply 10 into it self, the product will be 100, which is the number of men contained in the said Battail.



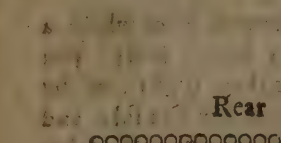
II.

To find what number of men are contained in a Battail, whose front and flanks are equal.

THis proportion very little differeth from the former, for whereas before you multiplied any

one side in it self, you must in this multiply the Front or Rear by either Flank, and the product shall give the number of men contained in the said Battail.

Example,



Suppose there be 20 in the Front and five in the Flank, and you desire to know what number there is in the whole body: If you multiply 20 by 5, your product will be 100, the number of men contained in the whole Body.

III.

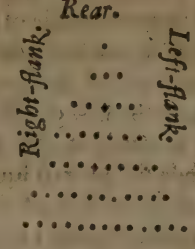
To find what number of men are contained in a Triangular Battail.

A Triangular battail cannot be composed except there be an odd man in the Front, and consequently, on either Flank: Wherefore, to find what number of men are contained in such a battail, you must multiply either Flank in it self, and the product shall be the number of men contained in the whole Battail.

Ex-

Example,

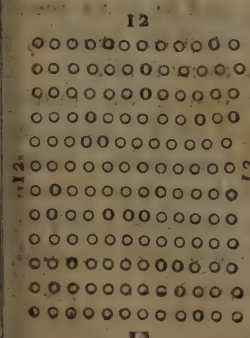
Let there be in either Flank 7, now we know that 7 is the Root of 49; wherefore you may conclude 49 to be in the whole.



IV.

Of two Square Battails to make one intire battail, which shall contain both the other.

A General having in two several places two square Battails of men, and commanding his Major or other Officers to reduce them into one entire body, I demand how that may be done? Let the two Battails be unequal, as one of 10, the other of 6; as in this Figure is seen.



Example.

First, ſquare the ſide of the greater Battail 10, *fecit* 100. then ſquare the ſide of the leſſer Battail 6, *fecit* 36. which added make 136. the ſquare root extracted gives the ſide of a Battail equal to them both: but for as much as 136 is no ſquare number, you muſt finde the neareſt ſquare that may be leſs, and that ſhall be the ſide of the entire Battail, which is 11. wherefore place 11. in rank, and 11. in file, and you ſhall have 121. in your Body, and 15. men over, which you may ſend out for Scouts or Centinels, or otherwiſe diſpoſe of them as occaſion ſerveth.

V.

A number of men being delivered to an Officer to make thereof a Square Battail, and ſuddenly to tell how many ranks he ſhall have, and how many men in each rank.

Suppoſe the number of men delivered to be 144. therefore extract the ſquare Root of 144, which is 12, and ſo many men ſhall you have in flank, and as many in file.

Note that if the number had not been a ſquare number, there would have been ſome odd men remaining, which you ſhould have diſpoſed of as before.

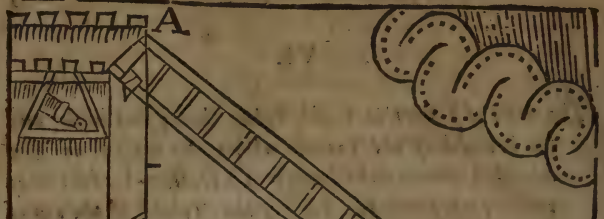
VI.

The wall of a Fort or Caſtle being thirty foot high, and the breadth of the Trench about the wall forty foot broad, I demand the length of a ſcaling-Ladder that will reach from the edge of the Trench to the top of the wall.

THis experiment is grounded upon the 47 Propoſition of the firſt of *Euclid*, who ſaith, In all right-angled-triangles, the ſquare of that ſide which lieth againſt the right angle, is equal to the two ſquares of both the other ſides.

From whence we may gather, that if the heighth of the Wall be ſquared, and the breadth of the Trench likewiſe ſquared, and thoſe two ſquared numbers added together, and from them extract the ſquare Root, that Root ſo extracted ſhall be the length of the Scaling-ladder required.

As for Example, in the Figure following.



Let A B represent the Fort, being 30 foot high, and B C the breadth of the Trench, 40 foot, then square 30, *fecit* 900, likewise square 40, *fecit* 1600: which added make 2500, the Root of which number is 50, the length of the Hipothenusuall or Scaling ladder required.

VII.

Admit the Semidiameter of the earth to be 3346 miles, and that there is a Mountain one mile in height. I demand how far such a Mountain may be seen at sea or on Land.

ADd the Semidiameter of the earth and the Mountain together, *fecit* 3437, whose square is 11812969. From which subtract the square of the semidiameter of the earth, *viz.* 11806096, there remains 6873, whose Root is 82 and three fourths; wherefore you may conclude, that the Mountain may be seen almost 83 miles.

VIII. *How*

VIII.

How to know the burthen of a Ship.

TO perform this you must take the length thereof at the Keel, the breadth at the Beam, and the depth in hold, and multiply them one in the other, the last product being divided by 100 gives you his Tunnage, which is the Kings allowance.

Example of a ship whose length at the Keel is 65 foot, his breadth at the beam is 26 foot, the depth in hold 10 foot, which numbers multiplyed each by other produceth 16900, which being divided by 100, gives you 169 Tun, which is the burthen of the said Ship.

IX.

The General delivered to his Master Gunner 3 Pieces of Ordnance, together with 168 pound of powder, the biggest of which Pieces spent at a shot 6 pound, the second 4 pound, and the third 2 pound, who commanded him to employ them against the battery of a Sconce, demanding of the Gunner how many shots each piece would make, being discharged one as often as another, and also how much powder each Piece would spend.

LEt the quantity of each Piece be set down into order, one under another, and added into one entire sum, as 6. 4. 2. *fecit* 12, behind which towards the right hand set down the summe of the Powder delivered, *viz.* 168. which if you divide by 12, the quotient will be 14, which certainly telleth that they will make 14 shots a piece against the Sconce.

lib.	*sh.*
6	
4	*x168*
2	*xxx* 14
12	*x*

Now to know how much powder each Piece will spend, multiply 14 by 6, *fecit* 84, for so much will the first Piece spend; again multiply 14 by 4, *fecit* 56, so much will the second spend; and lastly multiply 14 by 2, *fecit* 28, so much will the last Piece spend: which being added into one entire summe, the total will be 168 pound, which is equal to the powder by the General at first delivered.

lib.
84
56
28
168

IX.

A General having drawn the platform of a Fort, demanded of 50 Pioneers what time they required to finish it in: who replyed 6 weeks, or 36 dayes (which is all one) but the expedition was such that it must be finished in 8 dayes now would I know what number there must be imployed.

THE resolution of this question to some may seem difficult, but to others very plain and easie, for if you multiply 50 (which is the number of Pioneers) by 36 (the number of dayes which they require) and divide that product by 8 (which is the time that the Fort must be finished in) the quotient of that division will be 225, and so many must be imployed to finish it in eight dayes.

Pleasant

Pleasant Questions IN ARITHMETICK.

Question I.

To tell the number that another man shall think, be it never so great.

LEt the party that thinketh, double the number which he thought, which done, bid him multiply the sum of them both by 5, and give you the product (which they will never refuse to do, it being so far above the number thought) from the which if you abate the last figure of the product (which will alwayes be a Cypher or 5) the number thought will remain.

Example.

Let the number thought be 53, which doubled maketh 106, and multiplyed by 5 makes 530, then if you take away the Cipher which is in the last place, there will remain 53. the number thought.

Quest.

Quest. II.

Of the accusation of a Thief.

A Thief breaking into an Orchard, stole from thence a certain number of Pears, and at his coming forth he met with 3 men one after another who threatned to accuse him of theft, and for to appease them, he gave unto the first man half the Pears that he stole, who returned him back 12 of them. Then he gave unto the second half of them he had remaining, who returned him back 7. And unto the third man he gave half the residue, who returned him back 4, and in the end he had still remaining 20 Pears. Now do I demand how many Pears he stole in all? To answer this question you must work backward; for if you take 4 from 20, there will remain 16, which being doubled make 32, from which abate 7, and there will remian 25, which being doub'ed makes 50, from which substract 12 and there will remain 38, which again doubled make 76, the true number of Pears that he gathered.

Quest. III.

Of Three Sisters.

A Certain man having three Daughters, to the Eldest he gave 22 Apples: to the second he gave 16 Apples: and to the third he gave 10 Apples: and sent them to the Market to sell them, and gave them command to sell one as many for a penny as the other (namely 7 a penny) and every one to bring him home so much mony as the other, and neither

change

change either apples or moneys one with another; How could that be?

This to some may seem impossible: but to the Arithmeticians very easie. For whereas the eldest had 3 peniworths and one apple over, the second two peniworths and two apples over, and the youngest had one peniworth and three apples over: So that the youngest had so many single apples, and one peniworth, as the eldest had peniworths and one apple over, and consequently the second proportional to them both.

They made their Markets thus: A Steward coming to buy fruit for his Lady, bought all the apples they had at 7 a peny, leaving the odde ones behind, then had the eldest Sister three pence and one apple, the middle Sister two pence and two apples, and the youngest one peny and three apples. The Stuard bringing the fruit to his Lady, she liked it so well, that she sent him for the rest; who replyed that there were but few remaining: she notwithstanding sent him for them, and bid him bring them at any rate. The Steward coming to the Market again, could not buy the odde apples under a peny apiece (who to content his Lady was fain to give it) then had the youngest Sister three peniworths, the middle Sister two peniworths, and the eldest one peniworth, and so had they all four pence a piece, and yet sold as many for a peny one as another, and neither changed apples nor moneys one with another, as they were commanded.

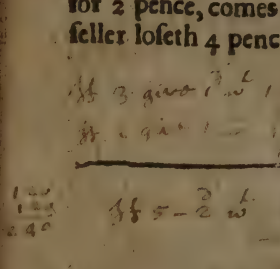
Quest.

Quest. IV.

Of one that bought and sold both at a rate, and yet in the end proved a Loser.

A Man bought 100 Egges at three a penny, having 120 to the hundred, also he bought a hundred more at two a penny, having likewise 120 to his hundred, these Egges being mingled, he sold them away for 5 two-pence, and 120 to the hundred as he bought them, the question is whether he gained or lost in that bargain.

If you work by the Rule of Three Direct, you shall find that his 120 Egges at 3 for a penny came to three shillings four-pence, and his 120 at 2 for a penny came to 5 shillings, which being added make 8 shillings 4 pence. Then again to see what they come to at 5 for 2 pence; work likewise by the rule of Three Direct, and you shall finde that 240 at 5 for 2 pence, comes but to 8 shillings, whereby the seller loseth 4 pence of the mony they cost him.



Experi-

Experiments in Geometry.

I.

How to take the Altitude of a Building, or other approachable height, by a line and plummet, the Sun shining.

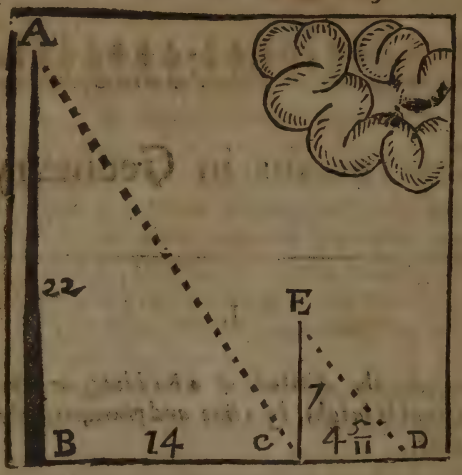
LEt the Building whose Altitude you desire to konw be A B representing a May-pole casting his shadow in a right line on the ground to C, at C let fall a line and plummet (whose length before you know in feet or inches) observing where the end of that shadow lights, which suppose at D, then measure the length of the shadow of the string, and consequently the shadow of the building, both which being exactly taken, work thus by the Rule of Proportion?

If C D, the shadow of the line and plummet 4 foot, and $\frac{7}{11}$ give E C, 7 foot in altitude;

What altitude doth 14 feet give, which is the length of the shadow of the May-pole.

Multiply and divide according to that Rule, and you shall finde in your quotient 22 foot, which is the true altitude of the building required.

How



How to take the Altitude by a Bole of water.

PLace on the ground a Bole of water, which done, erect your body ſtraight up, and go back (in a righ line) from the building, till you eſpy in the Center or middle of the water the top of the Altitude; which done, obſerve the place of your ſtanding, and meaſure the height of your eye from the ground, together with the diſtance from your ſtanding to the water, and the diſtance of the water to the Baſe or foot of the Altitude; which being all exactly taken, will help you to the Altitude required, by the rule of proportion.

Example.

Let the Altitude required be A B, the Bole of water placed on the ground at C, then go backwards from C (your body erected as ſtraight as may be tie your

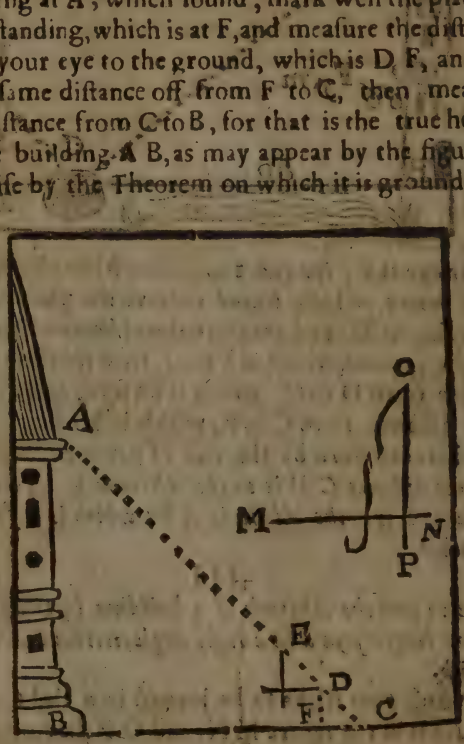
your eye at E, spy the top of the Altitude A B in the water, which found observe the place of your standing at D, and measure the altitude of your eye to the ground, which is 5 foot, then measure the distance from D to C, which is six foot, and likewise the distance from C to B, which is 80 foot, these 3 distances work by the rule of proportion. Thus, *As the distance C D is to the Altitude E D, So is the distance C B to the Altitude A B: which is 6 foot and 8 inches.*

III.

How to find the Altitude of a building by two sticks of one length joyn'd in a right angle, without Arithmetick.

CAuse two sticks to be joyned in a right-angle, as is in the figure M N, and O P, having at O a hole made wherein to hang a thread and plummet. The

The two ſticks being thus prepared, come to the building whoſe altitude you require (which building let be A B,) then applying the end A of your croſs ſtaffe to your eye, hold it up or down till the thread and plummet hang juſt upon the line C D, then go back or forward (as occaſion is given) till your eye at D looking over E eſpy the top of the building at A ; which found, mark well the place of your ſtanding, which is at F, and meaſure the diſtance from your eye to the ground, which is D F, and ſet that ſame diſtance off from F to C, then meaſure the diſtance from C to B, for that is the true height of the building A B, as may appear by the figure & likewiſe by the Theorem on which it is grounded.



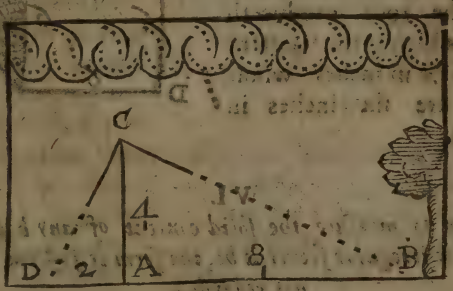
IV. *How*

IV.

How to finde a distance by the two Sticks joyned square.

THis Experiment is grounded upon the 4 *Prop.* of the of 6 *Euclid.*

Let the distance which you desire to know, be A B. set up a staffe at A. of 4 foot long, (or more or less at your pleasure,) at A C. at the end of the staffe C. place a thread C D. then hanging the angle of the square O. on the top of the staffe at C. lift it up or down, till you see the fartheſt part of your Longitude, the square so remaining, and the staffe not removed, draw the string that is fastened at C. close by the side of the square, till it touch the ground at D. then measure how many times the distance D A. is contained in the staffe, for so many times is the staffe contained in the Longitude.



Example: The staffe suppoſed 4 foot high placed at A. and the square being hung thereon at C. the one end thereof pointing at B. and the other to D.

then measure the distance D A, and you finde it to be two foot, then say, if C A contain D A two times A B shall contain C A as many, that is 8 foot, as may appear by the figure.

V.

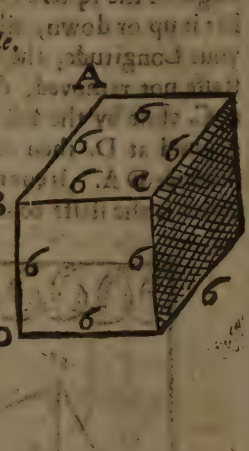
How to measure the solidity of a Cube.

THe Cube is a body composed of 6 square superficies of equal proportion, and is measured in manner following.

If you multiply any one side in it self cubically it produceth the said Cube.

Example.

Let the Cube A B C D begiven to be measured, the sides whereof are six inches in length, the square whereof is 36, which again multiplyed by the root produceth 216, which is the content of a Cube in inches whose sides are six inches in length.



VI.

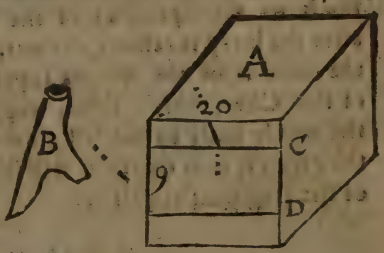
How to measure the solid content of any body how irregular soever it be, the form or fashion not regarded.

TO perform this you must prepare an hollow Cube, into which put your irregular body, which

which being placed therein you shall pour in so much water till it no more than cover the body in the Cube, then make a mark in the inside of the Cube where the superficies of the water toucheth. This done, take out the irregular body, and mark again directly under the former, where the brim of the water now toucheth, for the distance of these 2 marks, multiplyed by the square of the Cubes side, produceth the crassitude of that irregular body.

Example.

Suppose A. to be the cubical hollow vessel, whose inward side suppose to be twenty inches: B. the irregular body whose crassitude I desire. First, therefore I put B. into the hollow Cube A. and pouring in water till it be throughly covered, admit the brim of the water reach unto C, then taking out that irregular body again, admit the superficies of the water fall to D. then measure the distance between C. and D. which suppose is 9 inches, which multiplyed in 400, the square of the Cubes side produceth 3600. and so many cubical inches are contained in the irregular body B.



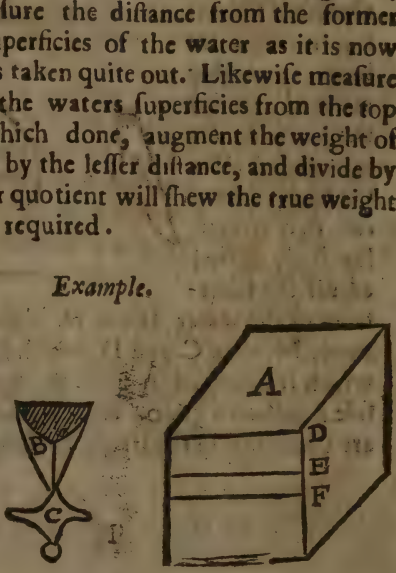
VII.

How the Weight of any part or portion of a solid body may be known, without separation thereof from the other part of the body.

HAving a Cube prepared as before declared, first, put the solid body thereinto, which done fill the Cube top full of water, then softly lift that body out of the water, till such time as there remain no more in the water than that portion whose weight you desire to know, at that instant make a mark on one side of the Vessel where the superficies of the water then toucheth, then take out the body all together, this done, measure the distance from the former mark to the superficies of the water as it is now after the body is taken quite out. Likewise measure the distance of the waters superficies from the top of the Cube, which done, augment the weight of the whole body by the lesser distance, and divide by the greater, your quotient will shew the true weight of the fragment required.

Example.

Admit B C to be in all 100 pound weight being either brass, iron, silver, lead, stone, or other mettal, my desire is to know the weight of the portion C. first therefore putting the whole



whole body into the vessel A. I fill it full of water, then lifting it softly up till all the body be out of the water exceping C. I finde the superficies of the water to be fallen to E. where I make a mark, then take out the whole body, admit the water is fallen to F. and that by measuring I finde E F. to be 8 inches, and D F. 20 inches, 8 multiplyed in 100, (the whole pillars weight) yieldeth 800, which divided by 20 (the greater distance) bringeth in the quotient 40, so many pound weight I conclude the portion C. to weigh.

VIII.

How Archimedes *found what quantity of Gold was taken out of the King of the* Syracusans *Crown, and how much silver put in the room thereof, without breaking of the Crown.*

Hiero King of the *Syracusans* in *Sicilia* had caused to be made a Crown of gold of a wonderfull weight to be offered for his good success in the wars, in making whereof, the Goldsmith fraudulously took out a certain portion of gold, and put in silver for it, so that there was nothing abated of the full weight, although much of the value diminished: Which thing at length being uttered, the King was sorely moved, and being desirous to try the truth, without breaking of the Crown, proponed the doubt to *Archimedes*, unto whose wit nothing seemed impossible, which although he could not presently answer, yet he had good hopes to devise some policy for that invention, and so musing thereon, as he chanced to enter into a bane full of

water to wash him, he observed that as his body entred into the bane, the water did run over, whereby his ready wit of such small effects conjecturing greater works, conceived by and by a reason of solution of the Kings question, and therfore rejoycing exceedingly (more than if he had gotten the Crown it self) forgot that he was naked, and so ran home crying as he ran *inveni, inveni*, I have found, I have found, and thereupon caused two massie pieces, one of gold and another of silver, to be prepared of the same weight that the Crown was of, and considering that gold is heavier of nature than silver, and therefore gold of like weight with silver, must needs occupy less room by reason of its more compact and sound substance, he was assured that putting the mass of gold into a vessel brim full of water, there would not so much water run out, as when he should put in the silver mass of like weight. Wherefore he tryed both, and noted not only the quantities of the water of each time, but also the difference or excess of the one above the other, whereby he learnt what proportion in quantity is between gold and silver of equal weight, and then putting the Crown it self into the water brim full (as before) marked how much water did run out then, and comparing it with the water that run out when the gold was put in, noted how much it did exceed that, and likewise comparing it with the water that run out when the silver was put in marked how much it was less than that, and by those proportions found the just quantity of gold that was taken out of the Crown, and how much silver was put in instead of it; by the which

ever since the proportions of metals one to another are tryed and found.

IX.

How a man may descend into the bottom of any Water or River, his body remaining dry.

THis Experiment was shewed at *Toledo*, by two *Greeks*, who taking a Cauldron of great capacity the mouth turned downward, and so hanging it in the air by ropes, they fasten certain shelves in the midst of the Cauldron, where they place themselves and a fire. Then to make it hang at *æqua libra*, they compass the Circumference thereof with leaden plummets on every side equally, and made of equal weight, lest any part of the Circumference of the mouth of the Cauldron when it is equally and softly let down into the water, should sooner touch the water than the whole Circumference, so should the water easily overcome the air inclosed in the Cauldron, and resolve it into moisture. But if by due proportion (the Cauldron thus prepared) be softly set down into the water, the air inclosed in the Cauldron (by resistance of the water) shall violently make himself place, not admitting the water to enter. So the men there inclosed, shall so long remain dry in the midst of the water, untill succes of time do by respiration weaken and consume the in closedair. But if in due time the Cauldron be softly and equally drawn out of the water, the men shall remain dry, and the fire not extinct.

This Experiment may thus be proved.

Take a Cup or Glass of a certain quantity, the Circumference of the mouth whereof shall be broader than the Circumference of the bottom, in the mouth whereof let be fastned a little stick, tying thereto a thread and plummet. On the stick fasten a little Candle of Wax, whose light may come only to the middest of the Cup, lest too much nearness of the water might suffocate the Candle; Then proportionably (as in the former Experiment) put the cup with the burning Candle into a Vessel full of water, and in due time draw it out softly and equally, so that no part of the mouth or Circumfercene thereof be drawn out before the whole, so shall the Candle ramain burning as it was when it went in.

X.

What proportion ought to be used in building of all Ships whatsoever.

THE due proportion of a Ship is that the Longitude of the Vessel whatsoever it be, more or less, ought to be divided into 300 equal parts, of the which parts 30 must be assigned to the depth, and the breadth shall contain 50, or the sixth part of the longitude, so shall the Ship be both proportionable, and more safe for Traffique.

XI.

The Description of a Ship that cannot be drowned.

THis Experiment was invented by one *Leonardo Fiorivanti* an *Italian*, who affirmeth that the like was never invented since the creation of the World: He describeth the said Ship on this manner, Take Beams of Firre or Pine-Tree, which of their own nature can never go down or sink, or abide under the water, and with these beams frame an Engine of the length of 60 foot, and 111 of the breadth of 20 foot, and of the height of 6 foot, laying the first rank in length, and the other traverse, and the third again in length, fashioning the forepart like unto other Ships, and in like manner bring the hinder part to good form, then with Irons binde it and fasten it that it cannot break, and upon this frame or foundation build your Ship of such fashion as you think best, so shall it be able to carry any voyage, without fear of drowning.

XII.

How to order a Picture, that if you look on the one side shall represent one thing, and on the other side another thing, and just before it a confusion.

LEt the two Pictures which you intend thus to order be both of one length and breadth, and provide a board of the same bigness about an inch thick,

thick, which must be planed in an indented form, (as are those boards which women use to pleat their Cuffes with, but the indentings must be a great deal bigger,) which provided, cause the Pictures to be cut exactly in long Labels of the same breadth as the sides of the indentings are, this done with paste or fine starch, paste those Labels to the sides of the indentings, one on the right hand and the other on the left hand, so proceeding till you have done all the Labels of the Pictures, then hanging it up, if you stand on the right side of the Picture, you shall see that Picture which was pasted on the right side of the indentings, and if on the left side of the Picture, the other, and right before in a confusion, which conceit hath caused no small admiration to those that know not the reason thereof.

XIII.

To break a Staffe upon two Glasses of water.

PLace the Glasses being full of water upon two joynt Stools, or such like, equidistant from the ground, and distant one from another, the length of the Staffe; Then place the ends of the Staffe upon the edges of the two Glasses, so that they be sharp, this done, with all the force you can, with another Staffe strike the Staffe which lies on the Glasses in the midst, and it will break, without breaking the Glasses or spilling the water.

XIV.

To make a Glass of water seem to boil.

TAke a Glass near full of water, and setting one hand upon the foot of it, hold it fast, turn slightly one of you fingers of your other hand upon the brim or edge of the Glass, having before privately wet your finger, and so passing softly on with your finger in pressing a little, the water will seem to boil and leap over the Glass by drops.

XV.

How to know the hour of the Day by the hand and fingers.

TAke a straw or the like, of the length of the Index, or the second finger, hold this straw very right between the thumb and the right finger, then stretch forth the hand, and turn your back and the palm of your hand towards the Sun, so that the shadow of the muscle which is under the thumb touch the line of Life, which is between the middle of the two other great lines, which is seen in the palm of the hand; this done, the end of the shadow will shew what of the clock it is, for at the end of the great finger it is 7 in the morning, or 5 in the evening, at the end of the ring-finger, it is 8 in the morning, or 4 in the evening, at the end of the little finger, or first joynt, it is 9 in the morning, or 3 in the afternoon, 10 and 2, at the second joynt, 11 and 1, at the third joynt, and mid-day in the line following, which comes from the end

end of the Index; Note that this Experiment must be performed by the left hand.

XVI.

How to make two Images, one of which shall light a Candle, and the other blow it out.

UPon the side of a wall make the figure of two Images, in the mouth of each put a pipe or quill, so artificially that it be not perceived, in one of which place Salt-peter very fine, and dry and pulverised, and at the end set a little match of paper, in the other quill Sulphur, beaten small; Then holding a lighted Candle in your hand, say to one of those Images by way of command, blow out the Candle, then lighting the paper with the Candle, the Salt-peter will blow out the Candle immediately, and going to the other Image, (before the snuff of the Candle be out,) touch the Sulphur with it, and say Light the Candle, and it will immediately be lighted.

XVII.

How to disguise or disfigure an Image, as a head, an arm, a whole body, &c. so that it hath no proportion, the ears to be over long, the nose as that of a Swan &c. yet the eye placed at a certain point, will be seen in a direct and exact proportion.

I Will not strive to set a Geometrical figure here, for fear it may seem too difficult to understand, but I will endeavour by discourse how mechanically you may with a Candle perceive it sensible; First, there must be made a figure upon paper, such

ſuch as you pleaſe, according to its juſt proportion, and point it as a Picture, afterwards put a Candle upon the Table, and interpoſe this figure obliquely between the ſaid Candle, and the Books of Paper, where you deſire to have the figure diſguiſed, in ſuch ſort that the height paſs a-thwart the hole of the Picture, then will it carry all the form of the Picture upon the Paper, but with deformity; follow theſe tracts and mark out the light with a coles black head or ink, and you have your deſire.

To finde now the point where the eye muſt ſee it in its natural form, it is accuſtomed according to the order of Perſpective to place this point in the line drawn in height equal to the largeneſs of the narroweſt ſide of the deformed ſquare, and it is by this way that it is performed.

XVIII.

How to make a Clock with one wheel.

MAke the body of an ordinary Dial, and divide the hour in the circle into 12 parts, make a great wheel in height above the Axel-tree, to the which you ſhall place the Cord of your counterpoiſe, ſo that it may deſcend, that in 12 hours of time your Index or Needle make one revolution, which may be known by a Watch, then put a ballance, which may ſtop the courſe of the Wheel, and give it a regular motion, and you ſhall ſee an effect as juſt from this, as from a Clock with many Wheels.

XIX.

To find what is hidden in two hands.

SUppose that a man holds divers things in his hands, as Gold and Silver, and in the one hand he holdeth the Gold, and in the other the Silver, now to know which hand the Gold is in, and which the Silver, appoint for the Gold 4 shillings, and for the Silver 3 shillings, or any other prices, so one be odd, and the other even, then bid him triple that which is in the right hand, and double that which is in the left hand, then bid him adde these two products together, and ask him if it be even, or odde; if it be even then the Gold is in the right hand, if odde, the Gold is in the left hand.

XX.

To make a Cone to move by the edge of a Table.

MAke therefore a Cone of paper, and set it on the Table cunningly conveying under it a Beetle, or such like creeping thing, and you shall see the thing to move on the Table, as if the paper were a living creature.

Exact Rules for Ringing all sorts of Plain Changes, and Cross Peals, with Directions for Pricking; also how to Hang Bells, with easie Directions for every thing which necessarily belongs to the Compleat Art of Ringing.

TO avoid all circumlocutions, he that intends to enter himself into a Company, must in the first place be able to set a Bell fore-stroak, and back-stroak; in the next place, he must know how to Ring round, or under Sally; neither must he be ignorant in the tuning of Bells; for the attaining of which, let him learn on Wire Bells, that he may know a Third, Fifth, and Eighth, which are the Principal Concords; or a Pitch Pipe made by an Organist may serve as well, containing eight Notes, or more, with their sharps, and flats, very useful in the Tuning of Bells.

Take this as a general Rule, begin at the Tenor or biggest Bell, and count three whole Notes, then an half Note or Sharp; three whole Notes, then

then an half Note or Sharp, and so on till you come to the least Bell, or Treble. For example, on four Bells, 1. 234, here the 432, are whole Notes, and the half note or sharp, is between the 1 and 2. On five Bells, 12: 345, the 543, are whole notes, and the half note or sharp is between 2 and 3. On six Bells, 123: 456. the half note or sharp is between 3, and 4. On eight Bells, 1: 2345: 678. one half note, or sharp, is between 5, and 6, and the other between 1, and 2. On ten Bells, 123: 4567: 8910. here one half note is between 7, and 8, and the next between 3, and 4. On twelve Bells, 12: 345: 6789: 101112. here one half note, or sharp is between 9, and 10. the next between 5, and 6. and the other between 2, and 3. which last is made contrary to the former Rule, it being but two whole notes, from the next half note to it; the reason is this, the Ninth is one whole note below the Eighth, therefore the 2. must be a whole note below the Treble, otherwise they would not be a true Eighth, therefore the half note is put between 2, and 3. With these Rules are required good Ears, to judge of the Concords, and then he will easily know whether the Bells be in Tune or not.

Of the Changes.

A Change between two Bells that ſtrike next to each other, is no more than removing into each others place, as 1, 2. the Change 2, 1. and ſo into their proper places again, 1, 2.

On three Bells there are ſix ſeveral Changes, in Ringing of which you muſt obſerve a Bell called the Hunt, the other two are called the extreme Bells, but improperly, becauſe every Bell Hunts in the ſix Changes. The name of Hunt is properly given to it, becauſe of its continual motion up and down amongſt the other Bells: the other two Bells are called extreams; becauſe when the Hunt is either before or behind them, there is a Change to be made then between them, called an extreme Change. There are two ſeveral waies to Ring the ſix Changes; the firſt by making the Treble Hunt, and the other the Tennor, ſuppoſing the Bells to ſtand thus, 123, you muſt Hunt the Treble thus; Hunt the Treble over the Second, and Third, making a Change between the Treble on each of thoſe two Bells in order; therefore firſt you muſt remove the Treble up over the Second, into the Seconds place, by making a Change between the Second and Treble thus 213. The Treble being removed up over the Second, it muſt next be removed up over the Third thus, 231.

Here note that when the Hunt moves from the foremoſt Bell towards the hindmoſt, then it Hunts up, as in the Changes afore ſpecified; but when

it moves from the hindmoſt Bell, towards the Bell that leads, then it Hunts down as by the following Changes. The Treble being Hunted up behind the extream Bells, an extream Change is next to be made between them, 321. The extream Change being made, the Treble muſt be Hunted down again before the Bells in this manner, 312——132. The Treble being now Hunted down, the next is to be an extream Change, 123. the laſt Change of the Six.

The other way of Ringing the Six Changes, is by making the Tennor the Hunt, which being behind already, it muſt firſt be Hunted down, as in theſe Changes, 123——132——312. The Third, which is the Hunt, being Hunted down before the Bells, the extreme Change muſt next be made between the 2 and 1. which are the extream Bells thus --321. The extream Change being made, the Third muſt be Hunted up again 231. The Third being Hunted up, another extream Change muſt be made which brings the Bells round in their right places again——123.

Now on four Bells, there are four and twenty Changes, in Ringing of which, there is one Bell called the Hunt, and the other three extream Bells; it never lies but once in a place, except when it comes before or behind the Bells, at which time it lies there twice together, it has the ſame courſe as in the ſix Changes aforeſaid, two of the extream Bells make a Change every time the Hunt comes before or behind them.

Theſ

These four Figures 1234, representing the four Bells, the Treble must be Hunted up behind the Bells thus;

2134
2314
2341

The next is to be an Extrem Change between the two farthest extream Bells, from the Hunt, which are the Second and Third.

3241
3214
3124
1324

The Treble being Hunted down, an Extream Change between the Second and Fourth,

1342
3142
3412
3421
4321

The Extream being made Hunt, the Treble as before making an Extream Change, every time Hunt comes before or behind the Bells.

4312
4132
1432
1423
4123
4213
4231
2431
2413
2143
1243
1234

The twenty four Changes are to be Rung another way in Hunting up the Treble, which is by making every Extream Change between the two neareſt Bells to the Hunt, as in theſe Changes; firſt, I Hunt the Treble up thus———————— 1234

Theſe two waies of Ringing the Twenty four differ only in making the Extream Changes; the one muſt be between the two fartheſt Extream Bells from the Hunt, and the other between the two neareſt to it.

2134
2314
2341

As you Hunt the Treble, ſo muſt you Second, Third, and Fourth. The way of Hunting the Third up, and making the Extream Change between the two fartheſt Bells from it, is thus, Firſt I Hunt up the Third over the Fourth; the Hunt being up, I make an Extream between the Treble, and the Second, and then Hunt down the Third again, and ſo to the end of the Peal after this manner.

1234
1243
2143
2134
2314
3214

The twenty four plain Changes are to be Rung ſixteen ſeveral waies, for in Hunting one Bell it is to be Rung four waies, that is, two in Hunting it up, and two in Hunting it down, ſo that four Bells make four times four, which is ſixteen: ſome of which I have here ſet down.

Treble Hunt up Extream between the two fartheſt Bells from it.		Second up, Extream between the two neareſt to it.		Fourth down Extream bethe two fartheſt Bells from it.	
1234	4312	1234	4231	1234	3421
2134	4132	1324	2431	1243	3241
2314	1432	1342	2341	1423	3214
2341	1423	1342	3241	4123	2314
3241	4123	1432	3421	4132	2341
3214	4213	1423	3412	1432	2431
3142	4231	1243	3142	1342	4231
1324	2431	2143	3124	1324	4213
1342	2413	2413	3214	3124	2413
3412	2143	4213	2314	3142	2143
3421	1243	4123	2134	3412	2134
4321	1234	4132	1234	4312	1234
		4312		4321	
		4321			

In the twenty four Changes, are contained the six Changes, the three Extream Bells in the twenty four make the six Changes in course, every Extream Change being one of the six, and the Hunt Hunting through each of the six Changes, make twenty four. For example, take the three Extream Bells in the first twenty four set down before, which are 234. and set down on them the six Changes thus——————— 234
Now take the first Change, which is 234, set 324
the Treble before it and Hunt it through 342
thus——————————1234 432
The Treble being Hunted up behind 2134 423
take the next Change of the six which 2314 243
is 324 set it directly under the first 2341 234
and Hunt the Treble down through it thus——3241
And so take each of the other six Changes and 3214
Hunt the Treble through them, it will make 3124
twenty four. 1324

On five Bells there are sixscore Changes to be Rung by observing a whole Hunt, a half Hunt, and three Extream Bells, the course of the whole Hunt is the same with the Hunt in the twenty four Changes, and Hunts up and down in the same manner. The half Hunt moves once, that is over one Bell every time the whole Hunt comes before and behind the Bells, but when the half Hunt is removed either before or behind the Extream Bells, then there is an extream Change to be made. For example, I make the Treble the whole Hunt, and Hunt it up: the Second, the

half

half Hunt, and half Hunt it up, making every Extream Change between the two fartheſt Extream Bells from the half Hunt: the Extream Bells are the Third, Fourth, and Fifth. Now obſerve, whereas in the twenty four Changes, an Extream Change was alwaies made, when the whole Hunt came before or behind the Bells, in theſe ſixſcore Changes, an Extream is alwaies to be made when the half Hunt comes before or behind the Extream Bells. Firſt, the Treble is to be Hunted up as in theſe Changes——————————12345

The whole Hunt being Hunted up, the Second which is the half Hunt, muſt be Hunted up over one Bell, as in this Change——32451. The half Hunt being removed up over one Bell, the whole Hunt muſt be Hunted down again, as in theſe Changes——————————32415

The whole Hunt being Hunted down, the half Hunt is to be removed up over the Fourth, which is the next Bell to it——13425. The whole Hunt is to Hunt up as before——31425. Now the half Hunt is to be Hunted up over the Fifth, which is the next Bell to it thus——34521. Here the Second, which is the half Hunt, is removed quite up behind the Extream Bells: yet the Extream Change is not to be made, until the whole Hunt hath removed down through the Bells, as in theſe Changes——————————34512

Take this for a certain Rule, that whenſoever the half Hunt has removed up behind the Extream Bells, or down before them,

34152
31452
13452

the whole Hunt must Hunt through the Bells, before the Extream Change is made, as in the last Change but four, which is 3, 4, 5, 2, 1. The Second being the half Hunt, is removed up behind the 3, 4, and 5. which are the Extream Bells; and then the whole Hunt being behind, Hunts immediately down, and now the Extream Change is to be made between the 3, and 4. which are the two fartheſt Extream Bells from the half Hunt thus, 14352. The Extream being made the whole Hunt and half Hunt are to remove again, but firſt the whole Hunt muſt be Hunted up after this manner——————————41352

The half Hunt being removed the whole Hunt muſt be Hunted down thus— 43215 43512
Now Hunt up the Tre— 41235 43125 43521
ble. After this Hunt 42135 41325 43251
down the Second before 42315 14325
the Extream Bells, then 42351 14235
Hunt down the Treble 24351
again, and make the Extream Change as in theſe Changes——————————24315

The laſt is the Extream Change which is 24135
made between the Third and Fifth, and 21435
this courſe is to be obſerved to the end of 12345
the Sixſcore Changes. 12453

According to the Terms of Art belonging to Ringing, when the Second is down, and the Fourth up, it is to be noted that the firſt Bell named, is the whole Hunt, and the next named is the half Hunt; the ſecond Bell down, is that Bell which is the whole Hunt, and hunts down the firſt

Change ; the Fourth Bell is the half Hunt, and to half Hunt up, that is to move up towards the hindmoſt Bell, the firſt time it moves at the beginning of the Peal, which are only directions in making the firſt Changes ; for one whole Hunt and half Hunt, may be Hunted ſeveral waies, either up or down at pleaſure. If you Hunt down the Second, it is thus, 12345——21345. The Second being hunted down, the Fourth which is the half Hunt muſt be removed up over the Bell thus——21354. The half Hunt being removed, The Second muſt be hunted up, for Example——————————————12354

Obſerve then that the Fourth, which is the half Hunt, being behind the Extream Bells, the next is to be an Extream Change, which may be made either between the two fartheſt Bells from the half Hunt, or the two neareſt to it ; and after the Extream Change is made, the whole Hunt and half Hunt muſt be Hunted as before.

13254
13524
13542
31542
31524
31524
31254
32154
32154
23154
23145

In every Sixſcore the Extream Changes may be made either between the two fartheſt Extream Bells from the half Hunt, or between the two neareſt to it, obſerving to make all the Extreams in one Sixſcore alike ; for inſtance, if you make the firſt Extream Change between the two fartheſt Extream Bells from the half Hunt, you muſt make all the following Extreams in the ſame Six-

Sixſcore between the two fartheſt Extream Bells alſo; or if you make the firſt Extream in any Sixſcore between the two neareſt to the half Hunt, you muſt make all the following Extreams in the ſame Sixſcore, between the two neareſt alſo.

The Sixſcore plain and ſingle Changes are to be Rung Eightſcore ſeveral waies; for although there are but Sixſcore ſeveral Changes on five Bells; yet by altering the whole Hunt, the half Hunt and Extreams, the courſes of the Changes are ſo altered, that the ſame Changes do not come all along together in any two of theſe Eightſcore waies.

The Eightſcore Changes are to be Rung eight ſeveral waies with one whole Hunt and half Hunt. The firſt is by hunting the whole Hunt and half Hunt both up; the Second is by hunting them both down; the Third is by hunting the whole Hunt up, and the half Hunt down; the Fourth is by hunting the whole Hunt down, and the half Hunt up, and each of theſe are to be Rung two other ſeveral waies: the firſt is by making the Extream between the two fartheſt Extreams from the half Hunt; and the Second is by making them between the two neareſt; that is, make the Treble the whole Hunt, and the Second the half Hunt. Now to Ring the Sixſcore Changes eight ſeveral waies is thus. Firſt, obſerve that your Extream Changes be made between the two fartheſt Extreams from the half Hunt, and then let Treble and Second be both up, Treble and Second both down; Treble down and Second up: Treble up and Second down.

In the next place let the Extream Changes be made between the two neareſt Extreams to the half Hunt, which is called Mediums, and then let Treble and Second be both up; Treble and Second both down; Treble down, and Second up; Treble up, and Second down.

On five Bells there are twenty Hunts, in ſhort it is thus: a whole Hunt and a half Hunt twenty times, and not one and the ſame Hunt whole, or half Hunt twice, as appears by theſe following figures ſtanding by two's; one of which is the whole Hunt, and the other the half Hunt——

So that here being twenty Hunts, and every one making Eight ſixſcore, as in the example of Treble and Second, that is twenty, which are the number of Hunts multiplyed by Eight, which are the number of Six ſcores, made by each Hunt, does produce Eightſcore ſeveral waies of Ringing Sixſcore Changes. In the Sixſcore Changes are comprehended the Twenty four, with the Six Changes. The Twenty four Changes are made between the half Hunt and the three Extream Bells, and the Six are made between the Extream Bells alone. The half Hunt in the Sixſcore, is the whole Hunt in the Twenty four; and there is one Change in the Twenty four made every time the whole Hunt comes before or behind the Bells, and one Change in the Six made every Extream, ſo that the Sixſcore rightly underſtood, is nothing elſe but hunting the half Hunt through

1.	2
1.	3
1.	4
1.	5
2.	1
2.	3
2.	4
2.	5
3,	1
3.	2
3.	4
3.	5
4.	1
4.	2
4.	3
4.	5
5.	1
5.	2
5.	3
5.	4

through every Change of the Six, and then hunting the whole Hunt through every Change of the Twenty four which makes Sixscore. In every Sixscore on five Bells, are six Extream Changes, there being twenty Changes from one Extream to another; as for instance, take these few Changes following, but with this observation, that there is a Line drawn between the figures, just twenty Changes from the beginning of the Peal, and the Change next following each Line is the Extream,

Treble

Treble and Second both up, Extream between the two fartheſt Extream Bells from the half Hunt.

12345	41352	24153	54312	25341	35241
21345	43152	24513	54321	52341	35214
23145	43512	24531	54231	52314	35124
23415	43521	42531	54213	52134	31524
23451	43251	42513	54123	51234	13524
32451	43215	42153	51423	15234	13254
32415	43125	41253	15423	15324	31254
32145	41325	14253	15243	51324	32154
31245	14325	14523	51243	53124	32514
13245	14235	41523	52143	53214	32541
13425	41235	45123	52413	53241	23541
31425	42135	45213	52431	53421	23514
34125	42315	45231	25431	53142	23154
34215	42351	45321	25413	53142	21354
34251	24351	45312	25143	51342	12354
34521	24315	45132	21543	15342	———
34512	24135	41532	12543	———	
34152	21435	14532	———		12345
31452	12435	———		13542	
13452	———		12534	31542	
———		15432	21534	35142	
	12453	51432	25134	35412	
14352	21453	54132	25314	35421	

Treble

Treble up, Fifth down, Extreams between the two fartheſt Extream Bells from the half Hunt

12345	25413	45123	41325	53214
21345	25143	45213	14325	53241
23145	21543	45231		35241
23415	12453	54231		35214
23451	21453	54213	13425	35124
23541	24153	54123	31425	31524
23514	24513	51423	34125	13524
23154	24531	15423	34215	13254
21354	24351		34251	31254
12354	24315		34512	32154
12534	24135	15432	34152	32514
21534	21435	51432	31452	32541
25134	12435	54132	13452	32451
25314		54212	13542	32415
25341		54321	31542	32145
52341	14235	45321	35142	31245
52314	41235	45312	35412	13245
52134	42135	45132	35421	
51234	42315	41532	53421	
15234	42351	14532	53412	12345
	42531	14352	53412	
	42153	41352	51342	
15243	42153	43152	15342	
51243	41253	43512		
52143	14253	43521		
52143	14523	43251	15324	
52431	41523	43215	51324	
25431		43125	53124	

Second

Second down, and Fourth up, Extream between the two fartheſt Extream Bells from the half Hunt.

12345	23145	43125
21345	32145	43152
21354	31245	
12354	31425	
13254	31452	43512
13524	34152	43521
13542	34125	43251
	34215	42351
	32415	24351
31542	23415	23451
31524	24315	
31254	42315	
32154	43215	
23154		

Second

Second and Third both down, Extream between the two fartheſt Extream Bells from the half Hunt.

12345	31542	13524	12543
21345	31524	13542	15243
23145	31254	15342	15423
32145	32154	15324	15432
31245	23154	15234	51432
31425	21354	12534	51423
31452	12354	21534	51243
	13254	21543	52143

21453

Third and Fifth up both, Extream between the two fartheſt Extream Bells from the half Hunt.

12345	23145	25143	52314
12435	32145	21134	52134
12453	32154	25134	52143
	23154	23514	
	21354	32514	
21453	21534	35124	52413
21435	21543	53214	52431
21345			

Fourth

Fourth down, Treble up, Extream between the two neareſt Extream Bells to the half Hunt.

12345	42315	25134	15243	45213
12435	42351	21534	15423	35231
14235	24351	21543	14523	54231
41235	23451	21453	41523	52431
42135	23541	2415	45123	52341
24315	23514	42153	54123	52314
21435	———	41253	51423	———
21345		14253	51243	
21354	25314	12453	51234	53214
23154	24531	12534	52134	53241
23145	42513	———	52143	
23415	24513		52413	
24315	25413	15234	54213	
	25143			

Fifth down, Treble up, Extream Changes between the two fartheſt Extream Bells from the half Hunt.

12345	21354	25341	53241
12354	21345	23541	53214
12534	23145	23451	35214
15234	23154	23415	32514
51234	23514	32415	32154
52134	25314	32451	32145
25134	52314	32541	31245
21534	52341	35241	31254

Treble and Second both down,		Second and Treble both down.	
12345	13524	12345	23154
12354	31524	21345	23514
21354	35124	21354	32154
23154	35214	12354	35214
23514	35241	13254	35124
23541	35421	13524	35142
23541		13542	35412
32514		31542	
32154		31524	
21354		31254	
13253		32154	

The

The Changes on Six Bells.

NOw let us come to the Changes on Six Bells, which are found by Ringing Artiſts, to be ſeven hundred and twenty; and there are Peals of Sixſcore, and Twelveſcore Changes to be Rung on them. The ſixſcore Changes are to be Rung by obſerving a whole Hunt, and half Hunt; which you muſt hunt after the ſame manner as you hunt the ſixſcore Changes on five Bells, and the extream Changes to be made by the ſame Rules as is afore expreſt. Only there is this difference between the ſixſcore Changes on ſix Bells, and the ſixſcore on five; for note, that on five Bells there are but three extreams, but on ſix Bells there are four extreams: again on five Bells, there are ſix extream Changes in every ſixſcore; but on ſix there are but four extream Changes: further obſerve, that whereas on five Bells in every ſixſcore, the Changes are the ſame in each, though altered in courſe; the Changes on ſix Bells, are not the ſame in each: for ſeveral ſixſcores, have ſeveral Changes, one ſixſcore having many Changes, which another ſixſcore hath not, as in this following Peal, Treble and Second both up, which is, 123456. The Example is demonſtrated in the next page.

123456	435162	243615	134625
213456	431562	243651	314625
231456	413562	423651	341625
234156	143562	423615	346125
234516	145326	423165	346215
234561	413526	421365	346251
324561	431526	412365	342651
324516	435126	142365	342615
324156	435216	143265	342165
321456	435261	413265	341265
312456	432561	431265	314265
132456	432516	432165	134265
134256	432156	432615	132465
314256	431256	432651	312465
341256	413256	436251	321465
342156	143256	436215	324165
342516	142356	436125	324615
342561	412356	431625	324651
345261	421356	143625	234651
345216	423156	143652	234615
345126	423516	413652	234165
341526	423561	431652	231465
314526	243561	436152	213465
134526	243516	436512	123465
134562	243156	436521	———
314562	241356	———	123456
341562	214356	346521	
345162	124356	346512	
345612	———	246152	
345621	124365	341652	
———	214365	314652	
435621	241365	134652	
435612	243165	———	

On

On ſix Bells may be Rung other Peals as Six-ſcores on the five ſmalleſt, the Tenor lying behind all the way. Treble and Second, or Treble and Fifth, with the Tenor lying behind raviſheth the Ear of all Lovers of the Art of Ringing.

The Seven hundred and Twenty Changes is the next thing I ſhall inſiſt upon, omitting to ſpeak of the Twelveſcore Changes, ſince they are comprehended in the Seven hundred and twenty. Now in Ringing the Seven hundred and twenty, there is a whole Hunt, a half Hunt, a quarter Hunt, and three Extream Bells. The half Hunt removes over one Bell, and when the half Hunt is removed before or behind the quarter Hunt, and Extream Bells, (at which time in a Sixſcore the Extream is made) then the quarter Hunt removes over one Bell, in the ſame courſe as the half Hunt moves, when the whole Hunt is before or behind. As for example, 1, 2, and 3. all up, *i. e.* Treble the whole Hunt, and to hunt up, Second the half Hunt, and to half Hunt up, and Third the quarter Hunt, and to quarter Hunt up: 4, 5, and 6, are Extream Bells.

There is alwaies an Extream Change to be made when the quarter Hunt comes before, or behind the Extream Bells: there are two waies of making the Extreams, which are the ſame here, as in the ſix-ſcore on five Bells, and made by the ſame Rule. Now the Treble and Second being the whole and half Hunt, they muſt be hunted in the ſame courſe, as in the Sixſcore on five Bells after this manner.

123456	324156	342516	134562
213456	321456	342561	314562
231456	312456	345261	341562
234156	132456	345216	345162
234516	134256	345126	345612
234561	314256	341526	345621
324561	341256	314526	
324516	342156	134526	

The half Hunt being hunted up, the Third is to remove over one Bell, and then the whole Hunt and half Hunt to remove again thus,

435621	431526	413256	243561
435612	435126	143256	243516
435162	435216	142356	243156
431562	435261	412356	241356
413562	432561	421356	214356
143562	432516	423156	124356
143526	432156	423516	
413526	431256	423561	

The

The whole Hunt and half Hunt being hunted down, the quarter Hunt muſt remove up over the Fifth, and then the whole Hunt, and half Hunt muſt hunt up again in this manner.

124536	412536	453126
214536	142536	351426
241536	145236	415326
245136	415236	145326
245316	451236	145362
245361	452136	415362
425361	452316	451362
425316	452361	453162
425136	453261	453612
421536	453216	453621

The whole Hunt and half Hunt being hunted up, the quarter Hunt muſt be removed quite up over the ſixth thus, 456321. the quarter Hunt being hunted up behind the Extream Bells; yet you muſt not make the Extream Change untill the whole Hunt, and half Hunt, have both removed through the Bells, for example,

456312	456231	425163,
456132	452631	425613
451632	452613	425631
415632	452163	245631
145632	451263	245613
145623	415263	245163
415623	145263	241563
451623	142563	214563
456123	412563	124563
456213	421563	

From theſe laſt Changes this certain and conſtant Rule is to be obſerved, that when the quarter Hunt removes either quite up, behind the Extream Bells, or down before them; the whole Hunt and half Hunt, muſt hunt through the Bells before the Extream Change is to be made.

The Extream Change is now to be made between the Fourth, and Fifth, being the two fartheſt Extream Bells from the Third, which is the quarter Hunt thus, 125463.

The

The Extream being made, the whole Hunt, half Hunt, and quarter Hunt, muſt be hunted as before; and firſt, the whole Hunt, and half Hunt are to be hunted up, as in theſe Changes.

215463	152463	541623
251463	154263	514623
254163	514263	154623
254613	541263	154632
254631	542163	514632
524631	542613	541632
524613	542631	546132
524163	546231	546312
521463	546213	546321
512463	546123	

The

The whole Hunt, and half Hunt, being hunted up, the quarter Hunt must hunt down under the Sixth, which is the next Bell unto it; and then the whole Hunt, and half Hunt, must hunt down again as in these Changes.

543621	541326	514236	254361
543612	543126	154236	254316
543162	543216	152436	254136
541362	543261	512436	251436
514362	542361	521436	215436
154362	542316	524136	125436
154326	542136	524316	
514326	541236	524361	

The quarter Hunt must be hunted down under the Fourth, and then the whole Hunt and half Hunt are to be hunted up again, for example, thus.

125346	523146	532416	153462
215346	521346	532461	513462
251346	512346	534261	531462
253146	152346	534216	534162
253416	153246	534126	534612
253461	513246	531426	534621
523461	531246	513426	
523416	532146	153426	

Now

Now the quarter Hunt is to be hunted down before the Extream Bells, and then the whole Hunt and half Hunt, hunt again before the Extream Change is made, after this manner.

354621	351426	315246	235461
354612	354126	135246	235416
354162	354216	132546	235146
351462	354261	312546	231546
315462	352461	321546	213546
135462	352416	325146	123546
135426	352146	325416	
315426	351246	325461	

Here you see the Twelvescore Changes are plainly set down, and now it lies at the Ringers pleasure either to bring the Bells round, and so end the Twelvescore; or else to proceed till they have finisht the Seven hundred and twenty. If the Bells are not brought round at the Twelvescore, they cannot come round, untill the Seven hundred and twenty Changes are performed, and then they come round in course. To bring the Bells round at the end of these Twelvescore Changes, the Extream is made between the Five and Four, which were the two Bells which made the last Extream Change, and brings them round in their right places again, as you may see by these following Figures, 123456. There are but two Extream Changes in every Twelvescore, wherein it is constantly

ſtantly obſerved, that the laſt Extream Change is to be made between thoſe two Bells which made the firſt Extream, otherwiſe the Bells would not come round at the end of the Twelveſcore.

Here note, that the Twelveſcore Changes are but an imperfect Peal, being but a third part of the Changes which are to be Rung on ſix Bells, and therefore not to be brought round, unleſs the laſt Extream Change is made out of courſe.

In every Seven hundred and twenty, there are ſix Extream Changes, there being ſixſcore Changes between each. The Twelveſcore Changes are to be Rung with any whole Hunt, half Hunt, and quarter Hunt, obſerving to make the laſt Extream Change, between thoſe two Bells which made the firſt.

The Seven hundred and twenty plain Changes are to be Rung One thouſand four hundred and forty ſeveral waies, by altering the whole Hunt, half Hunt, quarter Hunt and Extream Bells: for demonſtration ſake. On ſix Bells there are One hundred and twenty ſeveral Hunts; that is to ſay, a whole Hunt, half Hunt, and quarter Hunt, ſixſcore ſeveral times, and not one and the ſame whole Hunt, half Hunt, and quarter Hunt twice, as you may ſee by theſe figures——123.

123	213	312	412	512	612
124	214	314	413	513	613
125	215	315	415	514	614
126	216	316	416	516	615
132	231	321	421	521	621
134	234	324	423	523	623
135	235	325	425	524	624
136	236	326	426	526	625
142	241	341	431	531	631
143	243	342	432	532	632
145	245	345	435	534	635
146	246	346	436	536	641
152	251	351	451	541	642
153	253	352	452	542	643
154	254	354	453	543	645
156	256	356	456	546	651
162	261	361	461	561	652
163	263	362	462	562	653
164	264	364	463	563	654
165	265	365	465	564	

Each three of theſe figures repreſent the three Hunts; the firſt figure ſtands for the whole, the ſecond, for the half, and the third, for the quarter Hunt.

With whole, half, and quarter Hunt, the Seven hundred and twenty Changes are to be Rung, or ſet down twelve ſeveral waies; for example, take the firſt three Hunts, in theſe figures, 123. where the Treble is the whole Hunt, the Second, the half Hunt,

Hunt, and the Third, the quarter Hunt, which may be Hunted as I said before, six several waies in this manner: Treble, Second, and Third, all up——Treble and Second up, Third down——Treble up, Second and Third down———Treble, Second and Third, all dowr——Treble and Second down, Third up——Treble down, Second and Third up.

Each of these are to be Rung two waies: One is to make the Extreams between the two fartheſt Extream Bells from the quarter Hunt; the second way is to make the Extream between the two next Bells to the quarter Hunt.

By Treble, Second, and Third all up, is meant that the Treble is the whole Hunt, and to hunt up the first Change at the beginning of the Peal; the Second is the half Hunt, and to half hunt up, that is, to move up towards the hindmoſt Bells the first time it moves at the beginning of the Peal; the Second, is the half Hunt, and to half hunt up, that is, to move up towards the hindmoſt Bells, the first time it moves at the beginning of the Peal; and the Third, is the quarter Hunt, to move likewise towards the hindmoſt Bells, the first time it removes.

By Treble and Second up, and Third down, is meant, that the Treble and Second are to move up towards the hindmoſt Bell, the first time each removeth at the beginning of the Peal; and the Third being the quarter Hunt, is to move down the first time, which are only Directions of moving the Hunts at first, because they may be hunted either up or down.

Take

Take this as a general Rule for hunting any whole Hunt, half Hunt, and quarter Hunt, so as to produce six several waies to Ring the Seven hundred and twenty Changes.

Whole Hunt, half Hunt, and quarter Hunt, all hunted up. Whole Hunt and half Hunt, hunted up, and quarter Hunt down. Whole Hunt, hunted up, half Hunt and quarter Hunt down. Whole Hunt, and quarter Hunt down.

Whole Hunt, and half Hunt hunted down, and quarter hunt up; whole hunt, hunted down, half hunt, half hunt and quarter hunt, hunted up.

Now each of these six waies, may be Rung two other waies by altering the Extream Changes, that is to say, the first way is to be done by making the Extream Changes between the next two Extream Bells to the quarter hunt; and the other way is to make the Extreams between the two farthest Extream Bells from it.

The Seven hundred and twenty Changes are to be Rung twelve waies with one whole hunt, half hunt, and quarter hunt; so that with the sixscore hunts it is to be Rung sixscore times twelve waies, which make One thousand four hundred and forty several waies in Ringing the Seven hundred and twenty Changes.

In the Seven hundred and twenty plain Changes, the half hunt, the quarter hunt and the three Extream Bells, make the sixscore Changes on five Bells.

The twenty four Changes on four Bells, and the six Changes on three Bells, have also a perfect course in the Seven hundred and twenty, in the same

ſame manner as they had in the ſixſcore on five Bells. There is alwaies one Change in the ſixſcore made every time the whole hunt comes before or behind the Bells, which is every ſixth Change; and there is one Change of the twenty four made every time the whole hunt and half hunt comes before or behind the Bells, which is once in thirty Changes, and one Change of the ſix, made every Extream, that is once in ſixſcore Changes.

You may take the ſixſcore Changes on five Bells, Treble the whole, and Second, the half hunt as aforeſaid; and hunt the Second Bell through every Change of the ſixſcore, which will make the Seven hundred and twenty Changes, Tenor the whole hunt, Treble the half hunt, and Second, the quarter hunt.

Neceſſary

Neceſſary inſtructions for all who deſire to Ring the Changes well.

THey who Ring the Extream Bells in the twenty four Changes muſt be careful in minding the motion of the Hunt, that they may the better know when to make the Extream Changes.

In a ſixſcore on five Bells, he that Rings the half Hunt, muſt obſerve the motion of the whole Hunt; and they who Ring the Extream Bells, muſt obſerve the motions both of the whole Hunt, and half Hunt, that they may know when the half Hunt is to move, and alſo when to make the Extream Changes.

The whole Hunt is the eaſieſt Bell to Ring in any Changes, and the half Hunt is not ſo hard and difficult to Ring as an Extream Bell.

All Changes are to be Rung either by walking the Bells, or elſe by whole Pulls, or half Pulls. By that Ringing them of Walking the Bells, is meant the rounding of them four, ſix, eight times, or more in one Change; a thing commonly practiſed by young beginners.

Whole Pulls is to Ring two rounds in one Change, that is fore-ſtroke, and back-ſtroke in a

Change; ſo that every time you pull down the Bells at Sally, you make a new Change, differing from that at the back-ſtroke next before. Theſe whole Pulls were altogether uſed in former times: but of late, there is a more quick and ready way found out, called half Pulls, which is only once round in a Change, that is, one Change made at the fore ſtroke, and another at the back-ſtroke.

In Ringing half Pulls, ſome Peals do cut compaſs, that is the whole Hunt comes to lead at the back-ſtroke, to remedy which, make the firſt Change of the Peal at the back-ſtroke. By theſe following Rules you may know what Peals cut compaſs, and what do not, (*viz.*) of plain and ſingle Changes.

On

On Six Bells.

IN hunting either the Treble, the Third or the Fifth down, cuts compaſs, but hunting them up, does not.

In hunting the Second, Fourth, or Sixth up, cuts compaſs, but hunting them down does not.

Theſe Rules, leaving out the Tennor, ſerve for five Bells, and leaving out the Fifth and Tennor, they ſerve for four Bells.

The variety of Changes on any number of Bells.

The Changes do multiply infinitely, according to the number of the Bells. On two Bells, there are two Changes. On three Bells, three times as many Changes as there are on two. Four, four times as many as three; and ſo on in like manner to twelve Bells, as you may ſee by this Table of Figures repreſenting the Bells, and the Changes anſwering thoſe Bells in the Column to it thus.——

Bells.	Changes.
2	2
3	6
4	24
5	120
6	720
7	5040
8	40320
9	362880
10	3628800
11	39916800
12	479001600

The loweſt Figure belonging to twelve Bells, amounts to Four hundred and ſeventy nine millions one thouſand ſix hundred Changes, that can be made on twelve Bells. Now ſuppoſing that twelve Men ſhould undertake to Ring the Changes on twelve Bells, they would be ſeventy five years, ten months, one week, and three daies in Ringing them all over, according to the proportion of time, in Ringing ſeven hundred and twenty Changes, in the ſpace of one whole hour, reckoning twenty four hours to the day, and three hundred ſixty five daies in the year.

Now though on eight Bells there are 40320 Changes, yet the greateſt Peal that ever was Rung upon

upon them, was 1680. being only a third part of the Changes on ſeven Bells, which are to be Rung with a whole Hunt, half Hunt, quarter Hunt, half quarter Hunt, and three Extream Bells: but the moſt muſical Peal that ever was Rung on eight Bells, is Grandſir Bob, Treble, Second, and Fifth, half pulls on 123567. the Fourth, and the Tennor lying behind every Change thus, 123567 48. which has of late been much practiſed by the Colledge Youths.

Tendring Sixſcore on eight Bells, makes excellent harmony, 748. lying behind every Change, and a ſixſcore (four Extreams) on the ſix Bells, in the midſt, the Treble leading all the way, and the Tennor lying behind, making a Change at firſt between the four and five, and then proceeds forward in the Sixſcore, making the Second the whole Hunt, and the Seventh, the half Hunt; after the Sixſcore Changes are made, the Fourth, and Fifth muſt change their places again to bring the Bells round.

Having given you theſe ſhort yet eaſie Directions for all ſorts of plain and ſingle Changes, I ſhould proceed to croſs Peals, as Doubles, and Singles on four Bells, the Twelveſcore Long Hunts, or the Eſquires Twelveſcore; Doubles and Singles on five Bells; Tendrings Sixſcore on five Bells; Paradox on five Bells; Phœnix on five Bells; London Pleaſure on five Bells; what you pleaſe, Doubles and Singles on five Bells; New Doubles, Old Doubles, Grandſire Bob, and ſeveral other Peals, which will take me up too much time, wherefore I ſhall refer the Reader to his own and

others

others practice, for his further information. A word or two concerning Hanging of Bells, and I shall conclude.

Having got your stock in readiness, mark then whether the Cannons or Crown of the Bell be upright and true, then raise the Bell up tyed by some rope to the Cannons, in such sort, that the Bell may hang level, which you may find by applying a Plummet to the brim, then fasten a string to the Crown staple within the Bell, then a Plummet being tyed to the other end of the string, if the string hang in the midst between the two sides of the Bell whereon the Clapper should strike, the Crown staple is cast into the Bell true. The Bell being hung and the Gudgeons let in true by Keys, then if the Clapper hang in the midst between the two striking sides, and the Stock stand upright, the Bell is well hung.

Here note, that the trussling or taking up of a Bell far into the Stock by a notch, makes the Bell go easier, and lie lighter when it is set.

As for the tempering of the Gudgeons I leave to the Founder, and shall only speak of their polishing.

After they are fil d, or turned exactly round, take two pieces of Oak, and oyl each side of them, and strew fine Sand thereon, then clap them in a Smiths Vice, with the round of the Gudgeons between, then turn it about untill you think it is sufficiently polished, then all the sides of the Oak which had no Sand on them, and do as before, that will make them very smooth for your purpose; polish your Brasses well too, for the roughness

neſs of both, or either, will hinder the Bell from going ſmooth and ſteddy. It is very requiſite to hang Bells with bolts of Iron, to come from the Cannons through the Stock, and to faſten them with Keys on the top of the Stock, and not with Plates nailed on the ſides, for they are very inconvenient to faſten a Bell that is looſe in the Stock, or to alter the ſtroke if need require. As for the Rowl let it not be without nor within the hollow of the ſide of the Wheel, nor above, nor below the hollow at the bottom of the Wheel. Now the bigger the Wheel is, if the Frame will permit, the Bell will go the better; when the Wheel is new, nail Staies from the ſtock to each poſt, to keep it from warping.

FINIS.

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